THE American JOURNAL OF Surgery

NOVEMBER 1956

THURSTON SCOTT WELTON, M.D., EDITOR

Papers of the
American Proctologic Society

SIXTY-FIFTH YEAR OF PUBLICATION

NOVEMBER 1956

THE American JOURNAL OF Surgery

Editor THURSTON SCOTT WELTON, *New York*
Associate Editors BRADLEY L. COLEY, *New York* · ARNOLD S. JACKSON, *Madison*
E. ERIC LARSON, *Los Angeles*

ADVISORY BOARD

LYON H. APPLEBY, *Vancouver*
CLAUDE S. BECK, *Cleveland*
H. GLENN BELL, *San Francisco*
CLARENCE J. BERNE, *Los Angeles*
B. MARDEN BLACK, *Rochester, Minn.*
GEORGE R. BRIGHTON, *New York*
MEREDITH F. CAMPBELL, *Miami*
JAMES T. CASE, *Santa Barbara*
DWIGHT E. CLARK, *Chicago*
RANDOLPH LEE CLARK, JR., *Houston*
ISIDORE COHN, *New Orleans*
FREDERICK A. COLLER, *Ann Arbor*
PAUL C. COLONNA, *Philadelphia*
GORDON S. FAHRNI, *Vancouver*
EGBERT H. FELL, *Chicago*
HERBERT C. FETT, *Brooklyn*
EMIL GOETSCH, *Brooklyn*
CHARLES A. GORDON, *Brooklyn*
DONALD GUTHRIE, *Sayre, Pa.*
Detroit, LOUIS J. HIRSCHMAN
San Francisco, EMILE F. HOLMAN
Kansas City, Mo., CLAUDE J. HUNT
New York, THOMAS J. KIRWIN
Chicago, WALTER G. MADDOCK
New Orleans, RUDOLPH MATAS
St. Louis, CARL A. MOYER
Toronto, D. W. GORDON MURRAY
San Francisco, H. C. NAFFZIGER
Baltimore, EMIL NOVAK
Christmas Cove, Me., CLARENCE R. O'CROWLEY
New Orleans, NEAL OWENS
San Francisco, VICTOR RICHARDS
Raleigh, HUBERT A. ROYSTER
Philadelphia, HENRY S. RUTH
Memphis, ROBERT L. SANDERS
Baltimore, GRANT E. WARD

new!
calmative

nostyn®

2-ethylcrotonylurea, AMES

the power of gentleness for relief of daily tensions

- **moderates anxiety and tension**
- **avoids depression, drowsiness, motor incoordination**

different!

- NOSTYN is a new drug, a *calmative*
  —not a hypnotic-sedative
  —unrelated to any available chemopsychotherapeutic agent
- no evidence of cumulation or habituation
- does not cause diarrhea or gastric hyperacidity
- unusually wide margin of safety—no significant side effects

dosage: 150-300 mg. three or four times daily.

supplied: 300 mg. scored tablets, bottles of 48.

AMES COMPANY, INC • ELKHART, INDIANA

17686

Will infection develop here?

If the operating team scrubs up with pHisoHex and the patient's skin is "prepped" with pHisoHex, postoperative infection rates can be reduced as much as 75 per cent.[1]

pHisoHex preoperatively ensures "... a greater degree of surgical cleanliness ... than that possible through the use of any other detergent."[2] pHisoHex provides increased safety to the surgical patient—smooths the postoperative course.[3]

In 6242 operations by general surgeons, use of pHisoHex set an all-time low in postoperative infections of only 1.2 per cent.[4]

Antibacterial pHisoHex (detergent emulsion containing 3 per cent hexachlorophene) prolongs antisepsis, makes skin virtually sterile in constant users.

pHisoHex®
nonirritating, hypoallergenic

Winthrop **LABORATORIES**
New York 18, N. Y. Windsor, Ont.

1. Freeman, B. S.; and Young, T. K., Jr.: *Arch. Surg.*, 61:1145, Dec., 1950. **2.** Shay, D. E.: *Oral Surg., Oral Med., & Oral Path.*, 4:355, Mar., 1951. **3.** Canzonetti, A. J.; and Dalley, M. M.: *Ann. Surg.*, 135:228, Feb., 1952. **4.** Bowers, R. F., in discussion of Price, P. B.: *Ann. Surg.*, 134:476, Sept., 1951.

pHisoHex, trademark reg. U. S. Pat. Off.

WINTHROP LABORATORIES
1450 Broadway
New York 18, N. Y.

Gentlemen:
Please send me instruction pads for patients on bathing daily with pHisoHex® for 5 days prior to surgery.

..... M.D.

..... STREET

CITY..... ZONE..... STATE.....

The American Journal of Surgery

Contents • November 1956

VOLUME NINETY-TWO NUMBER FIVE

PRESIDENTIAL ADDRESS

Education of the Physician 645
STUART T. ROSS

ORIGINAL ARTICLES

Pneumatosis Cystoides Intestinalis 648
J. EDWIN ALFORD, GIOVANNI GALLETTI AND GORDON J. CULVER

Submucosal Rectal Nodules. A Clinicopathologic Review 657
FRANK C. SWARTZLANDER, RAYMOND J. JACKMAN AND MALCOLM B. DOCKERTY

Simultaneous Anterior and Posterior Pilonidal Cyst 666
M. D. REDDING

Observations on the Problem of Perianal Infection in Chronic Ulcerative Colitis . 668
URBAN R. FINNERTY

Treatment of Diverticulitis of the Colon. Choice of Operation 672
HENRY K. RANSOM

Factitial Proctitis. The Role of Lymphatic Destruction 678
J. F. WENZEL

Contents Continued on Page 5

The American Journal of Surgery is published monthly by The American Journal of Surgery, Inc., 49 West 45th Street, New York 36, N. Y. Yearly Subscription, $15.00 U. S. A.; $16.00 Canada; $17.00 Foreign including Pan-American Countries. Single Numbers $2.00; Special and Symposium Numbers $4.00. Re-entered as second class matter February 7, 1951, at the Post Office, New York, N. Y., and on February 7, 1951, at York, Pa., under the Act of March 3, 1879. November, 1956—New Series, Volume 92, No. 5. *Copyright ©, 1956, by The American Journal of Surgery, Inc.*

MANUSCRIPTS: All manuscripts should be addressed to the Editorial Office of the Journal, 49 West 45th Street, New York 36, N. Y.

Change of address must reach us one month preceding month of issue.

ADVERTISING REPRESENTATIVES

New York: P. A. Porter, P. D. Brewer, H. D. Robinson—JUDSON 2-3090
Chicago: R. H. Andrew—FRANKLIN 2-3861; Pasadena: Ren Averill—RYAN 1-9291

1956 1931 *today as 25 years ago*

PIONEERS IN PROGRESS AND SERVICE

1931 Company founded October 19...first to make parenteral solutions widely available

1934 COUNCIL ACCEPTANCE Company's solutions first to be accepted by Council on Pharmacy and Chemistry of the American Medical Association, and containers first to be accepted by American College of Surgeons

1938 FILTERDRIP First simultaneous filtration and drip infusion of blood

1939 TRANSFUSO VAC® The Transfuso Vac, along with the Transfuso Donor Valve, made possible the Closed Vacuum System of blood transfusion, essential to practical blood banking. Later, the Plasma-Vac was introduced as a part of this system.

1941 MILITARY MEDICINE The first parenteral solutions, sets and blood equipment to meet specifications of the Armed Forces

1946 EXPENDABLE FINE-MESH FILTER Introduction of expendable fine-mesh blood filter...most efficient available

1947 FUSO-FLO STOPPER Designed to remove fibrin clots before blood reaches filter

1947 TRAVAMIN® The only parenteral protein hydrolysate made from bovine plasma

1949 PEDIATRIC SPECIALIZATION The first solutions and equipment designed specifically for pediatric use

1950 TRAVERT® The first carbohydrate solution providing for infusion and utilization of more calories than glucose in equal infusion time

1952 EXPENDABLE BLOOD PUMP Eliminated hazard of air embolism during pressure transfusions...led to the development of the R48 combination administration set and pressure pump

1953 TRAVERT®-ELECTROLYTE SERIES Solutions for specific therapy of a variety of essential mineral losses

1956 SERA-VAC® The first blood bottle with sterile, internal, vacuum pilot tube for greater safety and convenience

1956 FLO-TROL CLAMP Precise, one-hand control of fluid flow

the most complete parenteral program....solutions, sets and blood equipment

SINCE 1931, PIONEERING PARENTERALS

BAXTER LABORATORIES, INC.

MORTON GROVE, ILLINOIS

Contents • November 1956

VOLUME NINETY-TWO NUMBER FIVE

Psychiatric Aspects of Proctologic Practice 683
RICHARD M. ALEXANDER

Non-specific Ulcerative Colitis, with Reference to Mortality, Morbidity, Complications and Long-Term Survivals Following Colectomy 688
HARRY E. BACON, LIN MIN OU YANG, PAUL T. CARROLL, BRUCE A. CATES, GUILLERMO VILLALBA AND ROBERT A. MCGREGOR

One-Stage Total Colectomy for Ulcerative Colitis 696
LAURENCE S. FALLIS

Traction Sigmoidoscopy 700
A. E. MOORE

Vascular Invasion in Carcinoma of the Colon and Rectum 704
FRANCIS J. BURNS AND JOHN PFAFF, JR.

The Surgical Management of Presacral Tumors 710
ROBERT J. ROWE AND DEWITT T. BROCK

Recent Trends in the Treatment of Cancer of the Colon and Rectum 727
NEIL W. SWINTON

Perineal Hernia Following Abdominoperineal Resection 735
HAROLD E. HULLSIEK

Anorectoplasty: Complications and Final Results 739
WILLIAM A. MCMAHON

Diagnosis of Schistosomiasis Mansoni by Sigmoidoscopy and Transparency Biopsy of the Rectal Mucous Membrane 743
BENJAMIN W. WARNER

Experience with the Optical Density Cancer Detection Test 748
PAUL J. FUZY, JR.

Contents Continued on Page 7

Why the Saftiflex* delivers a higher blood platelet count

Blood quality is protected from collection through administration by constant contact with nonwettable (siliconized) surfaces in the Saftiflex's completely closed system. Hemolysis, foaming or clot formation is negligible.

Simplified Plasma Aspiration

Atmospheric pressure forces the plasma to the top of the plastic container where it is easily aspirated through the diaphragm without the need for special needles.

Greater Convenience

Sterile and pyrogen-free Saftiflex is lighter and more compact for use and storage (same capacity requires ⅕ the space of bottles). Glass breakage or disposing is no problem. Supplied in individual polyethylene-lined aluminum foil envelopes.

Ask your hospital to investigate the Saftiflex System

SIMPLIFY FOR SAFETY WITH

SINCE CUTTER 1897

Saftiflex

PLASTIC BLOOD CONTAINERS AND EQUIPMENT

CUTTER LABORATORIES, Berkeley, California *TM

Contents • November 1956

VOLUME NINETY-TWO NUMBER FIVE

Management of the Bladder Following Abdominoperineal Proctosigmoidectomy and Other Extensive Abdominal Surgical Procedures. A Fifteen-Year Survey . . 752
LOWRAIN E. MCCREA AND HARRY E. BACON

SYMPOSIUM ON EXTRAMEDICAL PROBLEMS

Panel Discussion 756

SYMPOSIUM ON POSTOPERATIVE DIARRHEAS AND INFECTIONS

The Role of Enterotoxin of Micrococcus Pyogenes var. Aureus in the Etiology of Pseudomembranous Enterocolitis 765
G. M. DACK

Management of Postoperative Diarrheas and Infections 770
FRANK P. FOSTER AND JOHN L. DADEY

Postoperative Staphylococcal Enteritis 781
RUPERT B. TURNBULL

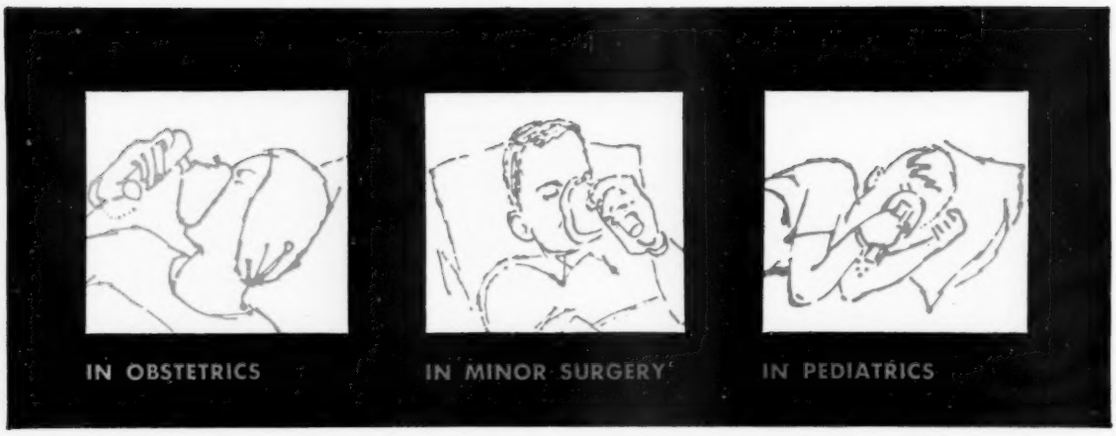
SYMPOSIUM ON PHYSICAL AGENTS USED IN TREATMENT OF ANORECTAL DISEASES

Radium and X-rays in the Treatment of Malignant and Benign Proctologic Diseases 787
PAUL W. SCANLON

Physical Therapeutic Methods in Anorectal Disease 792
GORDON M. MARTIN

Eight papers Read by Title at the Fifty-fifth Annual Meeting of the American Proctologic Society will be published in the January 1957 issue of the Journal.

FOR SELF-ADMINISTERED INHALATION ANALGESIA



"Trilene"® *and the*

Brand of trichloroethylene U.S.P. (Blue)

"Duke"® University Inhaler

No. 3160 Model-M

• *notably safe and effective*

"Trilene," self administered with the "Duke" University Inhaler, under proper medical supervision, provides highly effective analgesia with a relatively wide margin of safety.

• *convenient to use*

The "Duke" University Inhaler (Model-M) is specially designed for economy, facility of handling, and ready control of vapor concentration.

• *special advantages*

Induction of analgesia is usually smooth and rapid with minimum or no loss of consciousness. Patients treated on an ambulatory basis can usually leave the doctor's office or hospital within 15 to 20 minutes. Inhalation is automatically interrupted if unconsciousness occurs.

"Trilene" *alone* is recommended only for analgesia, not for anesthesia nor for the induction of anesthesia. Epinephrine is contraindicated when "Trilene" is administered.

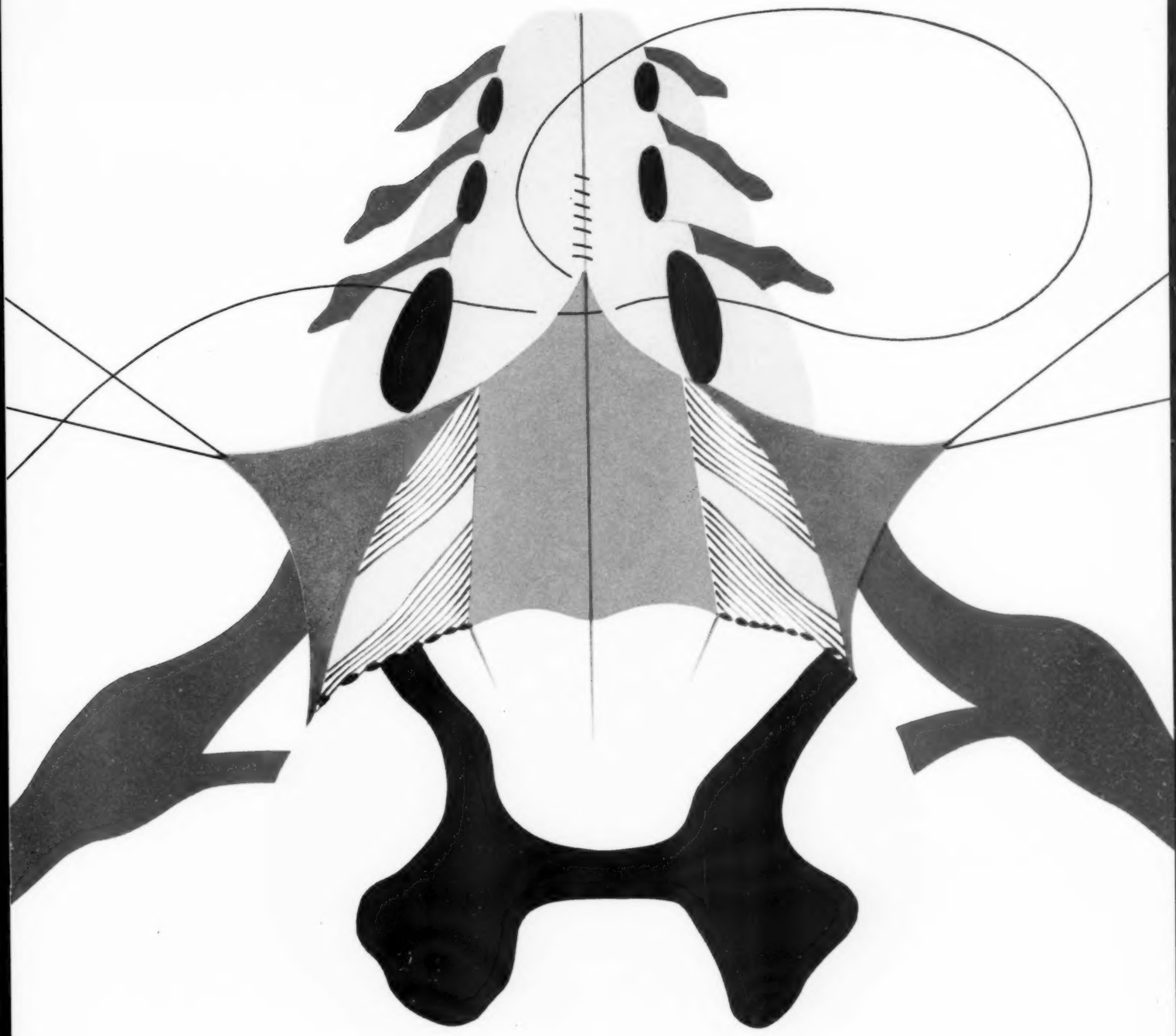
"Trilene" is available in 300 cc. containers, 15 cc. tubes.

Ayerst Laboratories • New York, N. Y. • Montreal, Canada

Ayerst®

Ayerst Laboratories make "Trilene" available in the United States by arrangement with Imperial Chemical (Pharmaceuticals) Limited.

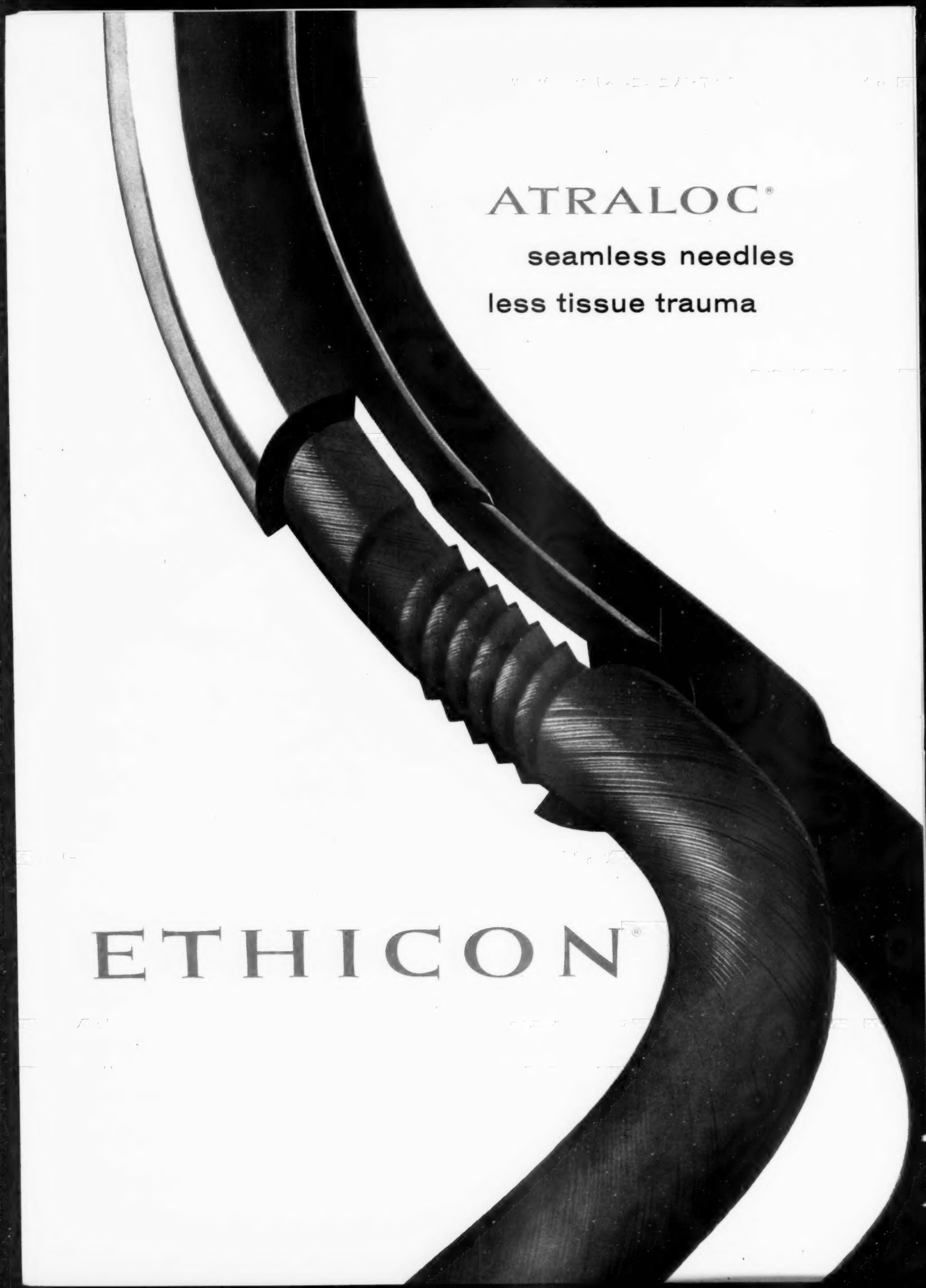
5556



setting new standards

ETHICON®

sutures


ATRALOC®
seamless needles
less tissue trauma
ETHICON®

NOW—the unequalled advantages of K_1—orally

Tablets

MEPHYTON®

(VITAMIN K_1, MERCK)

". . . vitamin K_1 is more effective than any other agent now available in combating drug-induced hypoprothrombinemia."[1] "Vitamin K_1 appears to be equally effective by the oral or intravenous route."[2] Beneficial effects are apparent in 6 to 10 hours following oral use.

Supplied: Oral MEPHYTON—tablets of 5 mg. of vitamin K_1, in bottles of 100. Emulsion of MEPHYTON —in boxes of six 1-cc. ampuls, 50 mg. of K_1 per cc.

References: 1. Gamble, J.R., et al. Arch. Int. Med. 95:52, 1955. 2. Gamble, J.R., et al. J. Lab. & Clin. Med. 42:805, 1953.

MSD

MERCK SHARP & DOHME

DIVISION OF MERCK & CO., INC. PHILADELPHIA 1, PA.

intramuscular

VARIDASE*

Streptokinase-Streptodornase Lederle

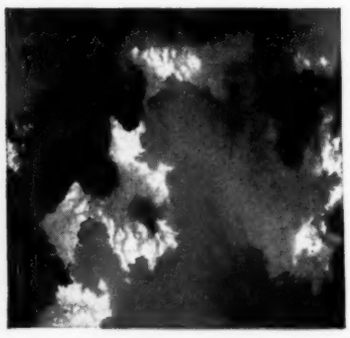
provides

remarkable

control

over

inflammation



Many patients with inflammatory lesions respond dramatically when VARIDASE is given intragluteally. Action is similar to VARIDASE applied locally, but results are much more swift and hitherto unattainable areas may be treated by the intramuscular route.

When employed in this manner, VARIDASE lyses the "limiting membrane" of leukocytes and fibrin which is thrown up about an inflamed or infected area. Thus, liquefaction and resorption of the contained exudate is made possible. In case infection is present, or feared, an antibiotic such as ACHROMYCIN* Tetracycline should be administered concomitantly to prevent the development of generalized sepsis.

Recent investigation has extended the list of indications for intramuscular VARIDASE therapy to include abscesses, burns, cellulitis, edema, epididymitis, hemarthrosis, sinusitis, lymphangitis, lymphadenitis, and thrombophlebitis with or without superimposed infection.

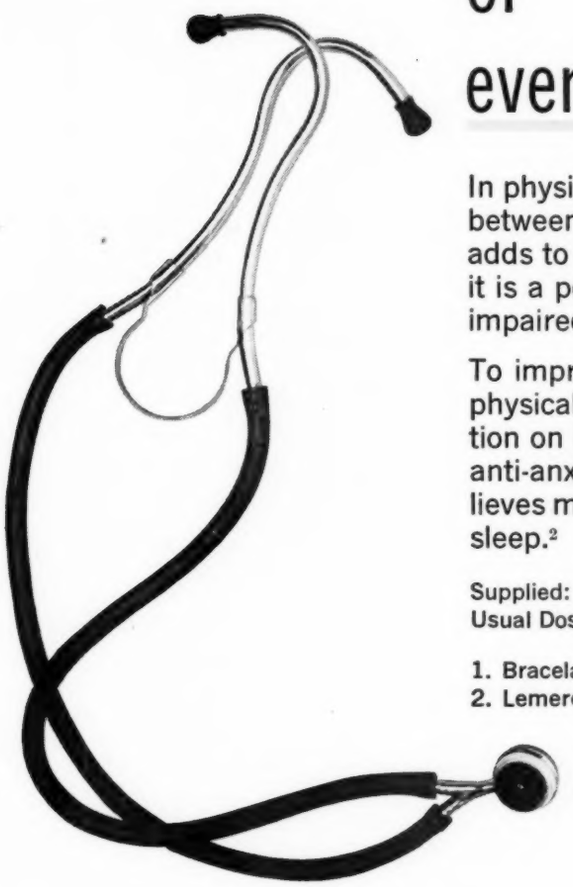
VARIDASE (Water Soluble—No Oil)

Administration: INTRAMUSCULAR, deep in the upper, outer quadrant of the buttock

Lederle LEDERLE LABORATORIES DIVISION, AMERICAN CYANAMID COMPANY, PEARL RIVER, N. Y.

*REG. U. S. PAT. OFF.

anxiety is part of every illness[1]



In physical sickness, anxiety is often a curtain between patient and physician. For anxiety adds to the stress of illness. In every practice, it is a potential source of uncertain progress, impaired rapport, and intensified symptoms.[1]

To improve the atmosphere for treatment in physical sickness, EQUANIL offers a calming action on both mind and muscle. It is a specific anti-anxiety agent—promotes equanimity, relieves muscle tension, and encourages normal sleep.[2]

Supplied: Tablets, 400 mg., bottles of 50.
Usual Dose: 1 tablet, t.i.d.

1. Braceland, F.J.: Texas State J. Med. 51 :287 (June) 1955.
2. Lemere, F.: Northwest Med. 54 :1098 (Oct.) 1955.

Equanil®

MEPROBAMATE
(2-methyl-2-n-propyl-1,3-propanediol dicarbamate)
Licensed under U.S. Pat. No. 2,724,720

anti-anxiety factor with muscle-relaxing action

Wyeth®
Philadelphia 1, Pa

BEFORE: Female, 61 years. Severe itch in anorectal and vulval areas for 7 years. Area about rectum and vulva reddened and fissured, sensitive, painful. Itching continuous. Moderate erythema.

AFTER: Hydrolamins applied 2 or 3 times daily. Itch and pain relieved first week. Within 3 weeks no irritation, erythema or itch.

STOPS

the silent agony

of PRURITUS ANI

in 98% of cases*

Breaking the itch-scratch-itch cycle is essential to control of pruritus ani. Topically applied Hydrolamins Amino Acid Ointment relieves itch *with anesthetic speed*—but without danger of tissue reaction.

In a series of 100 unselected sufferers from pruritus ani, the author* reported "Relief... experienced immediately in 98 cases." Moreover, in 88% of cases, "Within a few weeks' time there is every appearance of normal skin."

HYDROLAMINS®

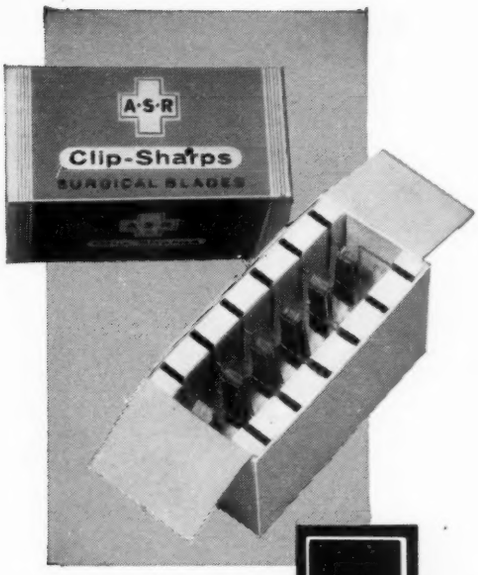
AMINO ACID OINTMENT

Hydrolamins offers an isotonic, specially selected combination of amino acids derived from lactalbumin in a vehicle of polyethylene glycol 1500. Hydrolamins buffers against local (bowel) irritants. It does *not* contain local anesthetics ("caines") or astringents.

SUPPLIED in 1 oz. (28 Gm.) tubes.

Leiwal PHARMACEUTICAL COMPANY CHICAGO 14, ILLINOIS

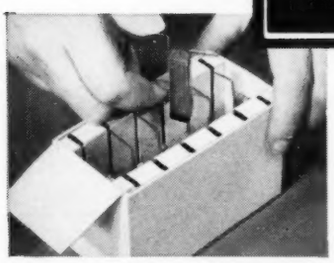
*Bodkin, L.G., and Ferguson, E.A., Jr.: Successful Ointment Therapy for Pruritus Ani, Am. J. Digest. Dis. 18:59 (Feb.) 1951.



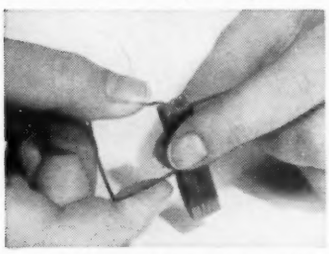
now! quick, easy blade sterilization with

A·S·R Clip-Sharps

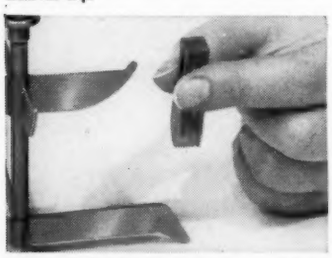
TRADE MARK



Remove cover – hold box in one hand. With other hand lift one wire holder (24 Blades) from box.



Grasp the wire clip between thumb and index finger and squeeze the wire. This releases the tension and enables the blades to be easily removed from the clip.



Holding the blades between thumb and index finger, simply slip them onto the rack. It's quick – and easy!

Clip-Sharps® are convenient wire clips containing 24 unwrapped A.S.R. Command Edge Surgical blades. There are six clips per box, protected by rust inhibiting paper.

Any sterilizing rack and any reliable, non-corrosive sterilizing agent may be used.

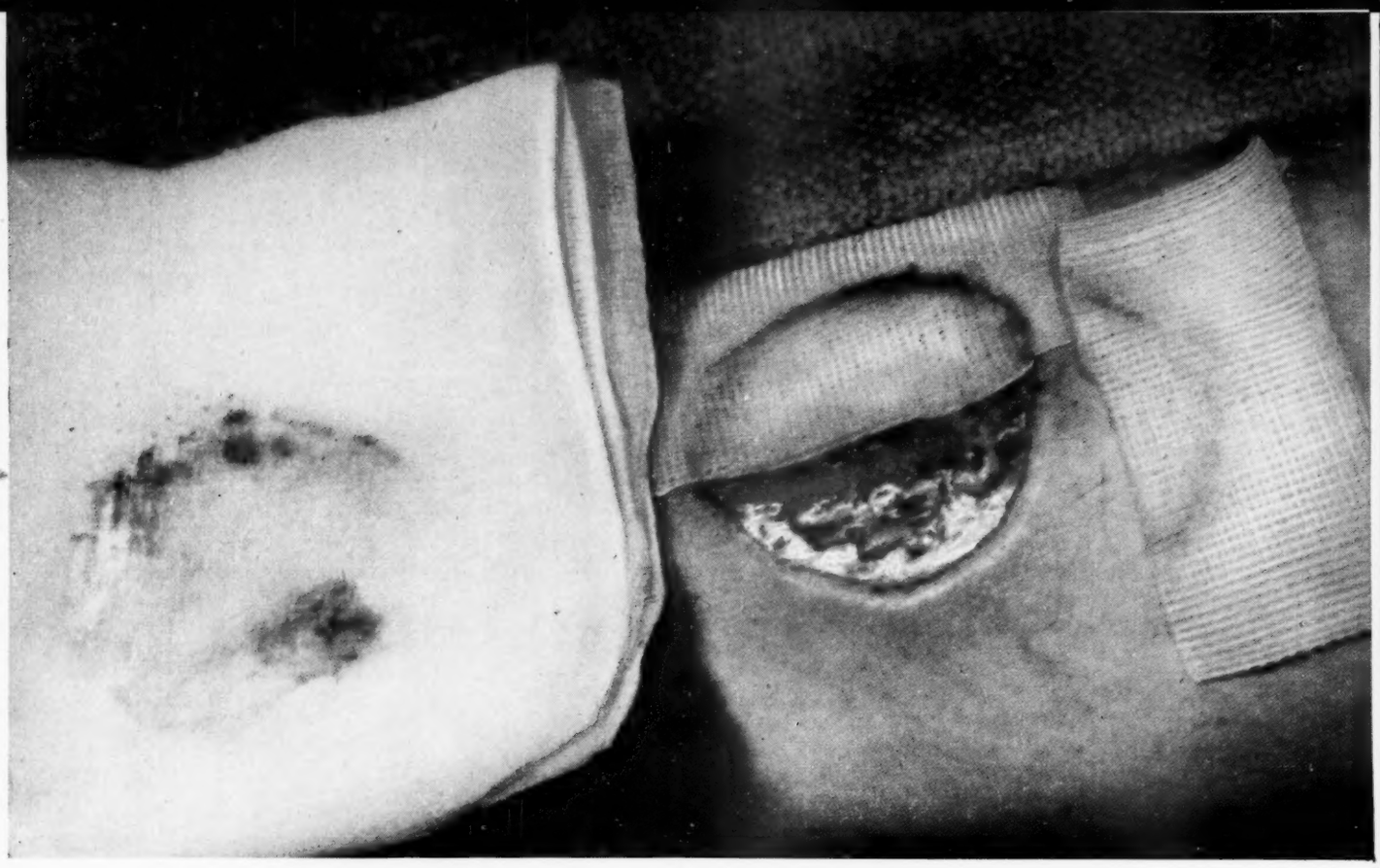
If you do not wish to sterilize the entire clip of 24 blades, remove only the required number from the clip and place them on the rack arm.

All A.S.R. Surgical Blades are Sharpometer tested. The A.S.R. Sharpometer, *only* device of its kind, measures the critical edge-fineness of every lot of A.S.R. Surgical Blades. These tests enable A.S.R. to guarantee . . . precise, uniform sharpness and dependability for every single blade!

NOW! For extra convenience, blades are alternated on clips.

Available through your Surgical Dealer. Write for further information.

A·S·R **HOSPITAL DIVISION**
AMERICAN SAFETY RAZOR CORP.
380 MADISON AVENUE
NEW YORK 17, N. Y.



Sterile **ADAPTIC®** *Non-Adhering Dressing*

This dramatic photo of a tropic ulcer shows how the exudate has passed through the ADAPTIC Non-Adhering Dressing and was absorbed by the sponge.

Non-Adhering

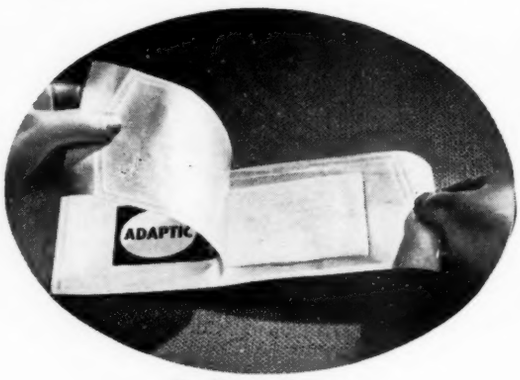
New growth tissue cannot become entangled with the dressing. A special bland petrolatum emulsion covers the fabric without clogging the pores.

Conforming

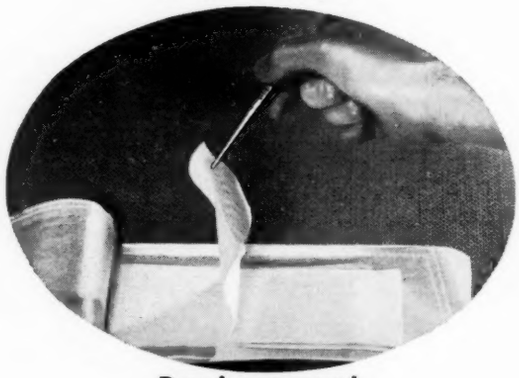
ADAPTIC Non-Adhering Dressing serves as a flexible, porous shield between the wound and secondary dressing—conforms to the slightest body contour.

Porous, Prevents Maceration

Open pores of dressing fabric allow exudate to pass through, thus preventing puddling at the wound site.



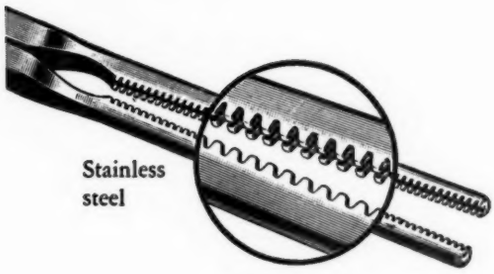
Sterile package easily peeled open



Dressing removed, insuring sterile technique.

Johnson & Johnson

© J&J 1956



the Kapp-Beck Serration*

Another Important Development
in Cardiovascular Instruments

by SKLAR

These Sklar instruments with the new Kapp-Beck Serration have been clinically evaluated and found to be highly acceptable for all procedures in the cardiovascular field.

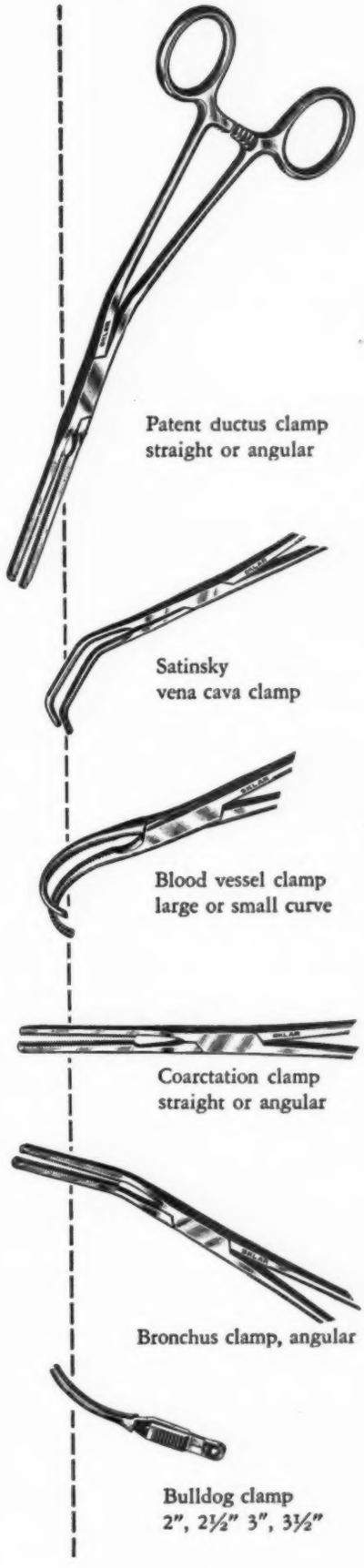
The rounded shoulders of the teeth minimize trauma and insure a positive grip with gentle pressure of the jaws.

Available through accredited Surgical Supply Dealers.

Sklar
LONG ISLAND CITY, N. Y.

Cardiovascular Instrument Brochure available upon request

*Patent Applied For



Patent ductus clamp
straight or angular

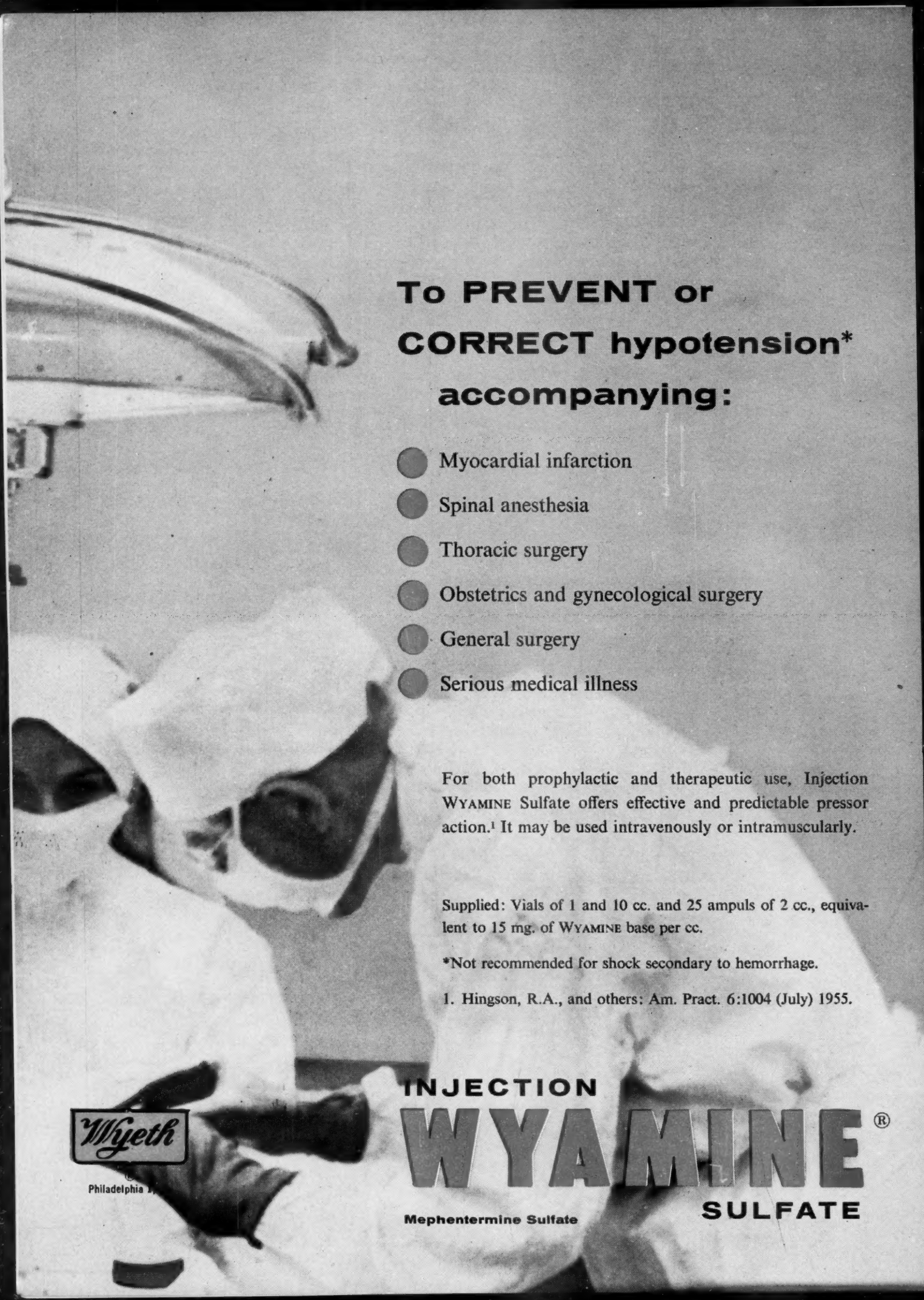
Satinsky
vena cava clamp

Blood vessel clamp
large or small curve

Coarctation clamp
straight or angular

Bronchus clamp, angular

Bulldog clamp
2", 2½" 3", 3½"



To PREVENT or CORRECT hypotension* accompanying:

- Myocardial infarction
- Spinal anesthesia
- Thoracic surgery
- Obstetrics and gynecological surgery
- General surgery
- Serious medical illness

For both prophylactic and therapeutic use, Injection WYAMINE Sulfate offers effective and predictable pressor action.[1] It may be used intravenously or intramuscularly.

Supplied: Vials of 1 and 10 cc. and 25 ampuls of 2 cc., equivalent to 15 mg. of WYAMINE base per cc.

*Not recommended for shock secondary to hemorrhage.

1. Hingson, R.A., and others: Am. Pract. 6:1004 (July) 1955.

Wyeth

Philadelphia

INJECTION

WYAMINE®

SULFATE

Mephentermine Sulfate

New! Hospital-Tested!

D & G SURGILAR*

STERILE PACK SURGICAL GUT

Keeps broken glass out of the O.R.!

Improves patient care!

*Trademark

Improved patient care with New

D & G SURGILAR*

Sterile pack surgical gut

Eliminates hazards of broken glass
Delivers stronger, more flexible gut
Greater protection for needle points
Frees more nurse-power for surgeons

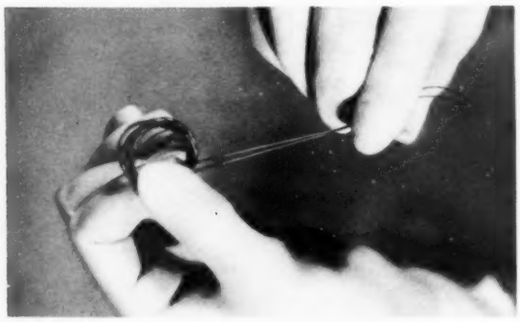
ATRAUMATIC® needle sutures now available in SURGILAR sterile pack

See how easy Surgilar is to use!

1. Improves patient care! Surgilar eliminates the dangers of broken glass in the operative field. Circulating nurse can remove 1 to 8 envelopes of standard length or ATRAUMATIC needle sutures at a time with one quick motion.

2. More nurse-power for surgeons! Suture nurse saves 33⅓% handling time—just one snip of the scissors opens the new D & G SURGILAR envelope. And with fresh, sharp ATRAUMATIC needles there's no need to thread, sterilize or sharpen. Nurses are freed for other important duties.

3. No more shattered tubes! Suture nurse quickly removes sterile, ready-to-use standard length or ATRAUMATIC needle suture, individually wrapped in easy-to-read label. Nurses report fewer worries about cut gloves, damaged linens and accidental tube breakage.



4. SURGILAR delivers more flexible gut! Suture nurse quickly straightens loose coil of superior gut. Surgeons report D & G SURGILAR delivers a stronger, more flexible strand of gut, free from kinks and weak spots often caused by tight reel-winding. Costs no more than tubes.

Ask your D & G representative for more information or write Director of Professional Relations.

D&G hospital-tested packaging makes the difference

*Trademark

PRINTED IN U.S.A.

AMERICAN CYANAMID COMPANY
SURGICAL PRODUCTS DIVISION
DANBURY, CONNECTICUT

and after surgery . . .

antibacterial protection without tissue toxicity

FURACIN has a unique mode of action—through disruption of the enzymatic metabolism of bacteria—*with no effect on regenerating human tissue.* FURACIN has the widest spectrum of topical antibacterials in use today, including many organisms that have developed resistance to other agents. Thus FURACIN provides *safe* protection against infections of surgical or traumatic wounds.

FURACIN's water-soluble base permits drainage, prevents maceration, promotes healing by control of infection. This nitrofuran—neither antibiotic nor sulfonamide—remains effective in the presence of blood, pus and serum.

Furacin® Soluble Dressing

BRAND OF NITROFURAZONE

Spread FURACIN Soluble Dressing: FURACIN 0.2% dissolved in water-soluble, ointment-like base of polyethylene glycols. 56 Gm. tube; 141 Gm., 454 Gm. and 5 lb. jars.

Sprinkle FURACIN Soluble Powder: FURACIN 0.2% in powder base of water-soluble polyethylene glycols. Shaker-top vial of 14 Gm.

Spray FURACIN Solution: FURACIN 0.2% in a liquid vehicle of polyethylene glycols 65%, a wetting agent 0.3% and water. Bottles of 59 cc. and 473 cc.

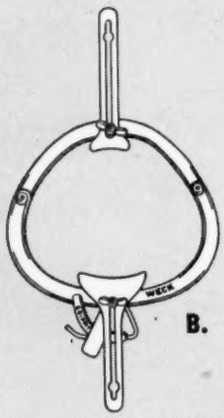
EATON LABORATORIES NORWICH, NEW YORK

SELF-RETAINING RETRACTORS

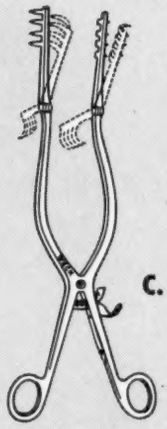
by

WECK

A.

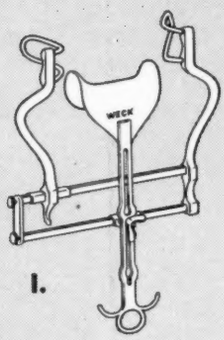


B.

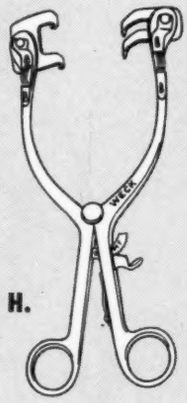


C.

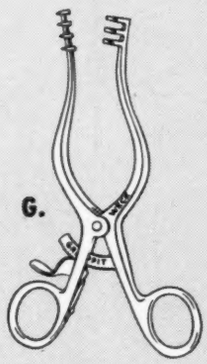
D.



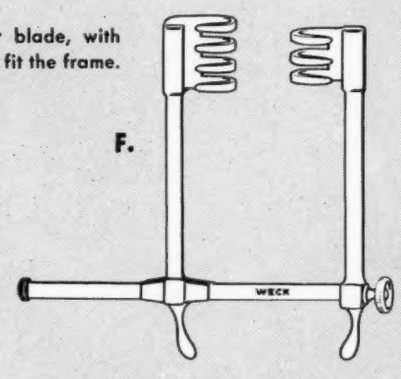
I.



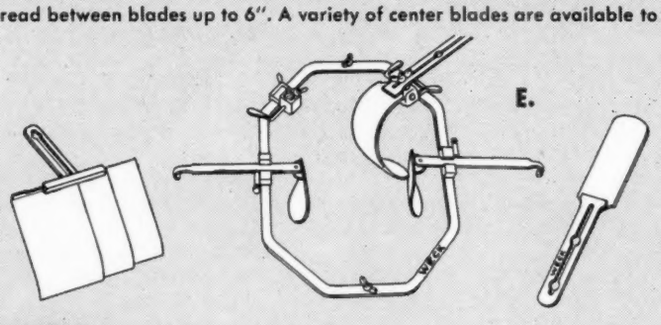
H.



G.



F.



E.

The Weck line of self-retaining retractors – only a few of which are shown here – includes a type for practically every operational requirement. Like all Weck surgical instruments, Weck retractors are precision manufactured – with faithful adherence to the original design specifications of each instrument. All are made of the finest Weck Stainless Steel and all carry the famous Weck guarantee. At a slight extra cost Weck self-retaining retractors may be had with the new Weck "Glare-Proof" Finish, which effectively eliminates reflected glare, yet maintains the corrosion-resistant, ease-of-cleaning properties of Weck Stainless Steel. Many are equipped with the remarkable GRIPPIT ratchet, which assures a non-slip hold, after a quick and simple adjustment to the desired opening and size of the operating field.

A. O'SULLIVAN-O'CONNOR SELF-RETAINING ABDOMINAL RETRACTOR (shown in collapsed position, ready for the first adjustment) is now Weck-made, with no changes in the original pattern or price. Complete with two fixed and three separate adjustable blades (two narrow, one broad) and Grippit ratchet.

B. O'SULLIVAN-O'CONNOR RETRACTOR expanded in operating position with one broad and one narrow blade.

C. BECKMANN THYROID OR MASTOID RETRACTOR with parallel opening blades on hinges so handle may be held away from field. Grippit ratchet.

D. WEXLER TRANSVERSE INCISION RETRACTOR with wound spread up to 5½". Large spreader blades hold full thickness of abdominal wall away from field. This same frame, with other blades, forms the Wexler-Balfour and the Wexler-Balfour deep abdominal retractors.

E. WEXLER ABDOMINAL RETRACTOR, consisting of a frame with 2 removable sliding blades. Also available to fit this frame are universal joints (which allow blades to be held securely at any position, angle or depth), as well as silver plated flexible copper, Deaver-type and Wexler expandable blades.

F. FRAZIER LAMINECTOMY RETRACTOR with one 3- and one 4-prong adjustable blade. An excellent general purpose retractor, good also for spinal fusions.

G. WEITLANER RETRACTOR with 3 x 4 sharp or blunt pointed blades, for use in small operating fields. Grippit ratchet.

H. HOEN LAMINECTOMY RETRACTOR with 2 sets of easily detachable blades in 2 sizes. Special blades for other uses can be supplied to order. Grippit ratchet.

I. BALFOUR RETRACTOR with two fenestrated end blades, one solid center blade, with spread between blades up to 6". A variety of center blades are available to fit the frame.

66 years of knowing how

WECK

EDWARD WECK & CO., INC. • 135 Johnson Street, Brooklyn 1, N. Y.

Manufacturers of Surgical Instruments • Hospital Supplies • Instrument Repairing

now—your choice of potencies!

to relax skeletal muscle, use

HIGH POTENCY FLAXEDIL
100 mg./cc. 1 cc. ampul

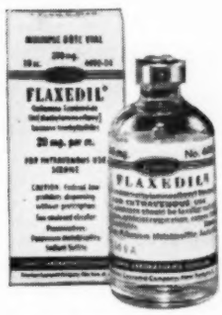
Administered directly. Convenient, time saving. Can be mixed in syringe with barbiturates.

FLAXEDIL*

Gallamine Triethiodide *Lederle*

greater convenience more predictable

Unlike curare, which must be administered according to individual patient response, FLAXEDIL dosage can be more easily pre-determined according to the patient's weight.



REGULAR FLAXEDIL
20 mg./cc. 10 cc. vial

Lederle LEDERLE LABORATORIES DIVISION AMERICAN Cyanamid COMPANY PEARL RIVER, NEW YORK

*REG. U. S. PAT. OFF.

IN THESE PATIENTS WITH TUBERCULOSIS—

- Candidates for surgery who need short-term protection to prevent or minimize spread of infection
- Hospitalized patients who are unresponsive to other chemotherapeutic agents

A new and potent tuberculostatic agent can be a life-saving agent—

PYRAZINAMIDE

PYRAZINOIC ACID AMIDE

The record shows that PYRAZINAMIDE produces a high percentage of good immediate, even if only briefly enduring results, such as:

1. Reduction of fever, cough and quantity of sputum with concomitant gains in appetite, weight and well-being.

2. X-ray evidence of partial clearing of far-advanced chronic fibrotic lesions in a small percentage of patients and also in a larger percentage of patients with acute infiltrative disease.

3. Remarkable improvement or healing in patients with extrapulmonary lesions such as draining sinuses, mucosal lesions and lymphadenopathy.

4. Conversion of sputum in 10% of cases.

... when used as indicated.

PYRAZINAMIDE is available through hospital pharmacies.

MSD

MERCK SHARP & DOHME

DIVISION OF MERCK & CO., INC., PHILADELPHIA 1, PA.

the surgical lubricant

hermetically sealed to guarantee sterility

K-Y

STERILE LUBRICANT

greaseless
harmless to rubber
non-irritating
water soluble
transparent

Johnson & Johnson

© J&J 1956

MEAD

Your R_x of **Sustagen Feedings q.2 h.**

buffers acid
builds tissue
accelerates healing
provides a bland high protein diet

Sustagen®

PROVIDES FOOD FOR THE PATIENT
PROVIDES THERAPY FOR THE LESION

a peptic ulcer patient ...
comfortable...well fed...**on the job!**

MEAD JOHNSON

SYMBOL OF SERVICE IN MEDICINE

"...a new approach to wound healing..."[1]

Panafil® ointment

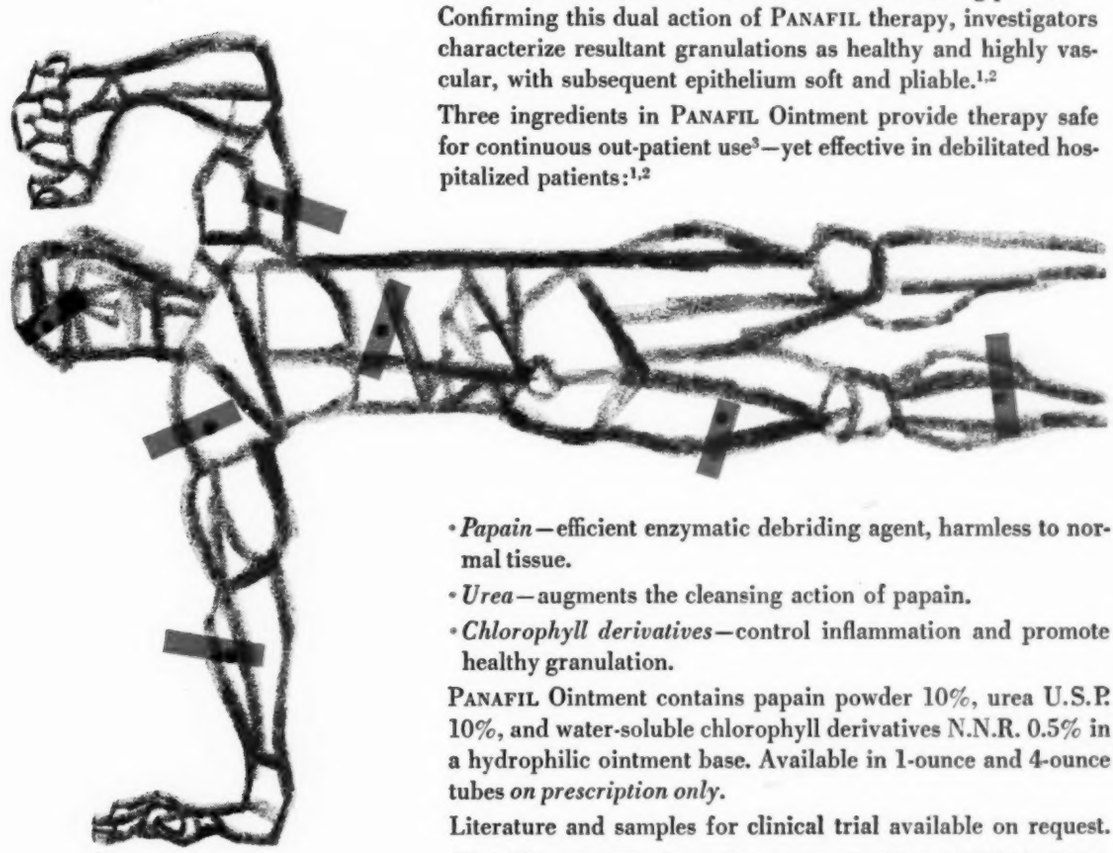
debrides necrotic tissue

keeps wound clean

promotes normal healing

PANAFIL Ointment meets the need, in stubborn, slow-healing wounds, for a "...topical preparation which...can both clean out the resistant lesion and foster the natural healing process."[1] Confirming this dual action of PANAFIL therapy, investigators characterize resultant granulations as healthy and highly vascular, with subsequent epithelium soft and pliable.[1,2]

Three ingredients in PANAFIL Ointment provide therapy safe for continuous out-patient use[3]—yet effective in debilitated hospitalized patients:[1,2]



- *Papain*—efficient enzymatic debriding agent, harmless to normal tissue.
- *Urea*—augments the cleansing action of papain.
- *Chlorophyll derivatives*—control inflammation and promote healthy granulation.

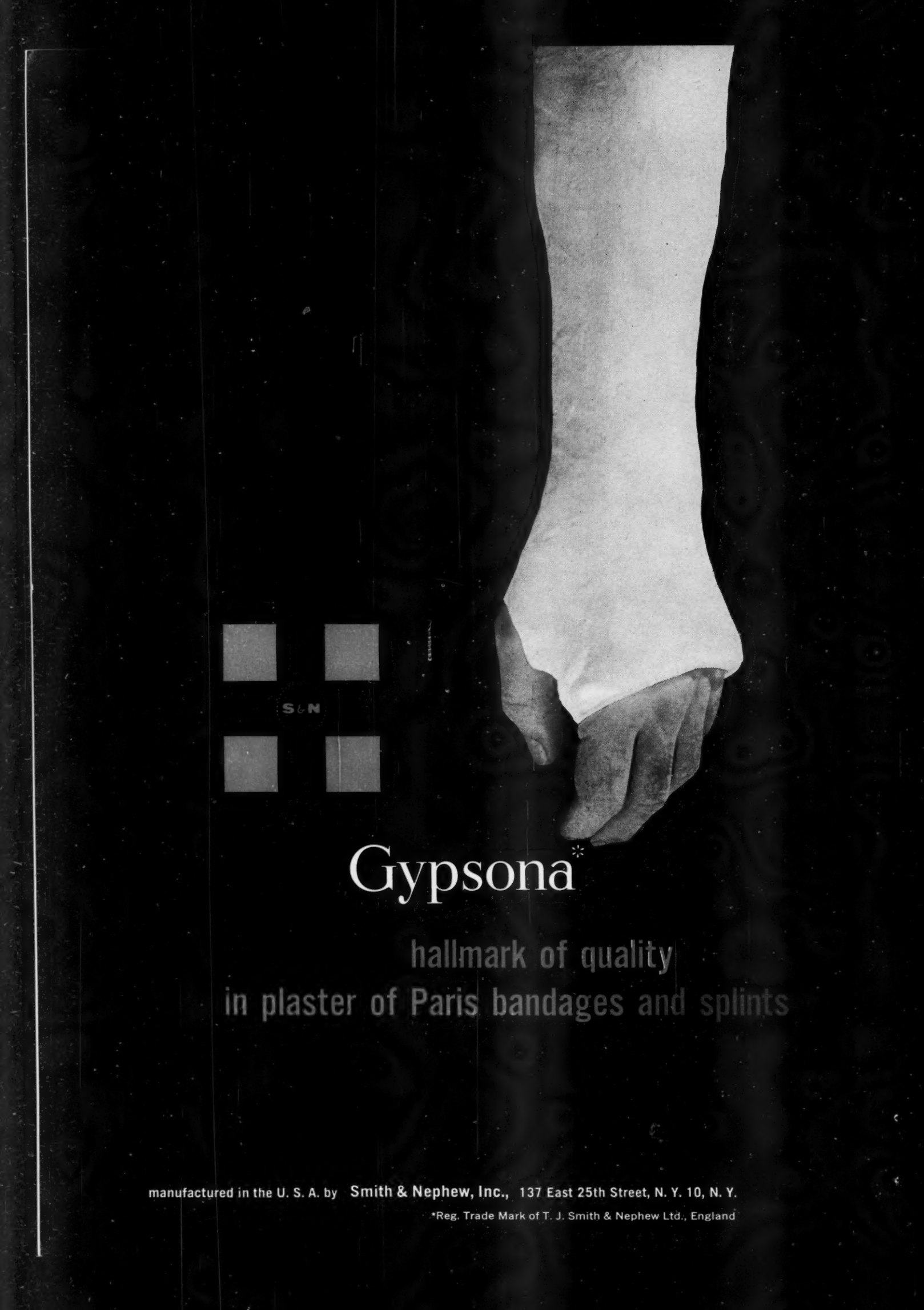
PANAFIL Ointment contains papain powder 10%, urea U.S.P. 10%, and water-soluble chlorophyll derivatives N.N.R. 0.5% in a hydrophilic ointment base. Available in 1-ounce and 4-ounce tubes *on prescription only.*

Literature and samples for clinical trial available on request.

(1) Miller, E. W.: New York State J. Med. *56*:1446, 1956. (2) Morrison, J. E., and Casali, J. L.: Am. J. Surg., to be published. (3) Garnes, A. L., and Barnard, R. D.: Angiology, in press.

PANAFIL FOR IMPROVED ENZYMATIC THERAPY

Rystan company • MOUNT VERNON, N.Y.



Gypsona*

hallmark of quality in plaster of Paris bandages and splints

manufactured in the U. S. A. by **Smith & Nephew, Inc.,** 137 East 25th Street, N. Y. 10, N. Y.

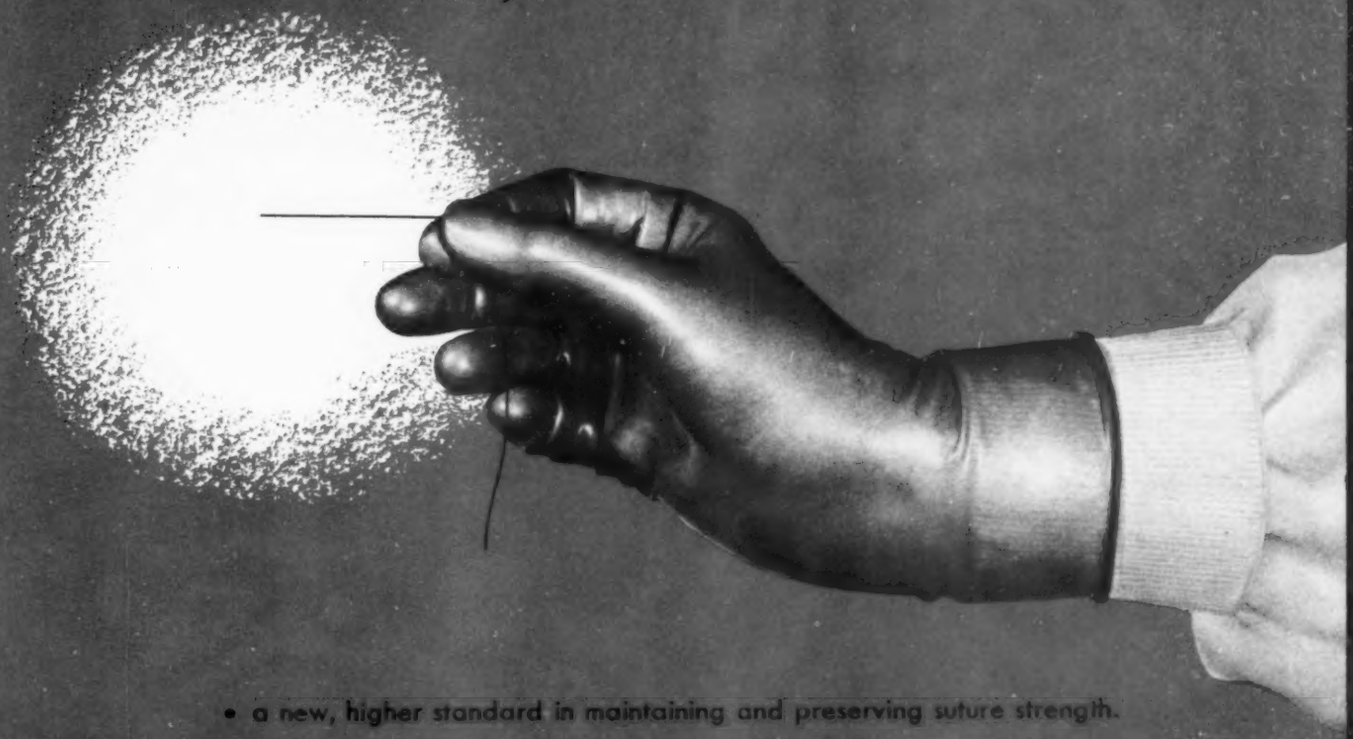
*Reg. Trade Mark of T. J. Smith & Nephew Ltd., England

Announcing

Gudebrod's new

CERETHERMIC* FINISH SILK

the most important advance in
silk sutures in 20 years



- a new, higher standard in maintaining and preserving suture strength.
- unequalled in handling qualities, cut ends won't fray.
- smoothness never before attained, virtually no adherence to tissue.

in

COLOR CODED

TRADE MARK PATENT APPLIED FOR

silk sutures

Available in CHAMPION serum-proof silk, pre-sterilized DRI-PAK*, cut lengths ready for use

Gudebrod Bros. Silk Co., Inc.
225 West 34th St., New York 1, N.Y.

*T.M.

TO THE SURGEON:

To secure ample testing samples, please complete and mail this card (no postage required).

GUDEBROD BROS. SILK CO., INC., 225 W. 34th St., New York 1, N.Y.

Gentlemen: Send sample DRI-PAK jar of Gudebrod Color-Coded Silk Sutures with CERETHERMIC FINISH to the Operating Room Supervisor.

_____ R.N.

HOSPITAL _____

CITY _____ STATE _____

(SURGEON'S SIGNATURE) _____ M.D.

Gudebrod

SILK SUTURES, with the

CERETHERMIC* FINISH,

speed

operating time

The truly superior handling qualities of these new sutures make operating procedures easier for both the surgeon and the O.R. Supervisor.
You can get this sample jar by sending the postpaid return card.

Send for this generous sample package

Use Gudebrod

COLOR CODED sutures for positive identification

TRADE MARK PATENT APPLIED FOR

*T.M.

FIRST CLASS
Permit No. 1598
Sec. 34.9 P.L.&R.
New York, N.Y.

BUSINESS REPLY CARD
No postage stamp necessary if mailed in the United States

POSTAGE WILL BE PAID BY

Surgical Division

GUDEBROD BROS. SILK CO., INC.
225 W. 34th STREET
NEW YORK 1, NEW YORK

Mail this card for sample package which contains one dozen assorted sizes of Color-Coded Silk Sutures in DRI-PAK Jar, sizes 2-0, 3-0, 4-0.

new

Sigmamycin*

OLEANDOMYCIN TETRACYCLINE

*TRADEMARK

a new maximum
in therapeutic
effectiveness

a new maximum
in protection
against
resistance

a new maximum
in safety and
toleration

for
your
entire

multi-spectrum
synergistically
strengthened...

Sigma

OLEANDOMYCIN TETRACYCLINE

patient
population

mycin*

a new certainty

in antibiotic therapy,
particularly for
the 90% of patients
treated at home
and in the office

Superior control of infectious diseases through superior control of the changing microbial population is now available in a new formulation of tetracycline, outstanding broad-spectrum antibiotic, with oleandomycin, Pfizer-discovered new antimicrobial agent which controls resistant strains. The synergistic combination now brings to antibiotic therapy: (1) a new fuller antimicrobial spectrum which includes even "resistant" staphylococci; (2) new superior protection against emergence of new resistant strains; (3) new superior safety and toleration.

*TRADEMARK

Pfizer

superior control of infectious disease through superior control of the changing microbial population

new Sigmamycin*

OLEANDOMYCIN TETRACYCLINE

A synergistically strengthened multi-spectrum antibiotic

Sigmamycin is a new antibiotic formulation providing: (1) the unsurpassed broad-spectrum activity of tetracycline, the outstanding broad-spectrum antibiotic discovered and identified by Pfizer; (2) the action of oleandomycin, the new antimicrobial agent which combats those strains, particularly among staphylococci, now resistant to tetracycline and other antibiotics.

Sigmamycin embodies a new concept in the use of antibiotics, for with this new synergistically active preparation, the development of refractory pathogens and their emergence as important sources of superinfection are more fully controlled.

New superior safety and toleration— Sigmamycin brings to antibiotic therapy new superior safety, new unexcelled toleration because: (1) tetracycline, an outstandingly well-tolerated antibiotic, is formulated with oleandomycin, also known to be remarkably free of adverse reactions; (2) the synergism between oleandomycin and tetracycline enhances antimicrobial potency.

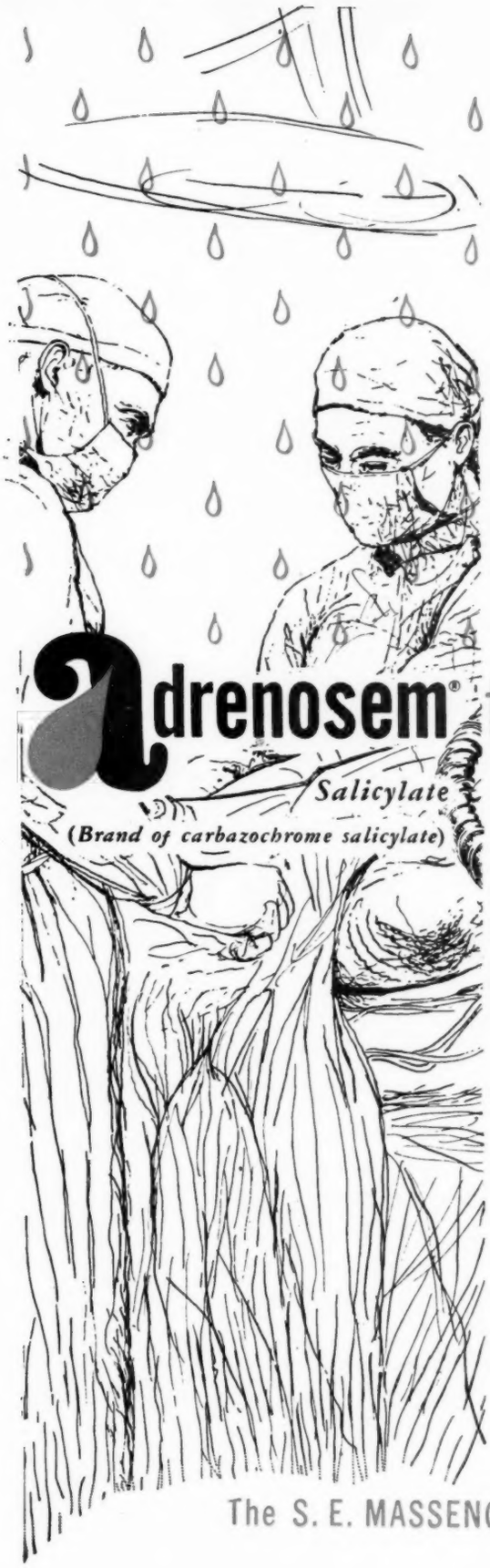
Dosage: 1 to 2 capsules q.i.d.

Supplied: Capsules, 250 mg. (oleandomycin 83 mg., tetracycline 167 mg.) Bottles of 16 and 100.

*TRADEMARK

Pfizer

PFIZER LABORATORIES, *Division, Chas. Pfizer & Co., Inc.*, Brooklyn 6, N. Y.



"...specific for conditions characterized by increased capillary permeability."

1

Adrenosem® to control bleeding

Salicylate

(Brand of carbazochrome salicylate)

In his study of 330 hospital cases treated with Adrenosem* Salicylate, Bacala concludes that this systemic hemostat is "specific for the strengthening of capillary resistance."

He summarizes: "Experience with the drug is cited from 317 surgical and 13 obstetrico-gynecological cases. Most numerous were the 233 tonsillectomies, of which 207 patients were benefited by its use; post-tonsillectomy bleeding was reduced from 19.8 to seven per cent. The drug was also found useful in gastrointestinal bleeding, cataract extraction, epistaxis, incisional seepage, transurethral prostatectomy, menometrorrhagias, cervical oozing, antepartum and postpartum bleeding, threatened abortion, and prevention of capillary hemorrhages during Hedulin or Dicumerol therapy."[1]

1. *Bacala, J.C.: The Use of the Systemic Hemostat Carbazochrome Salicylate, West. J. Surg. 64:88 (1956).*

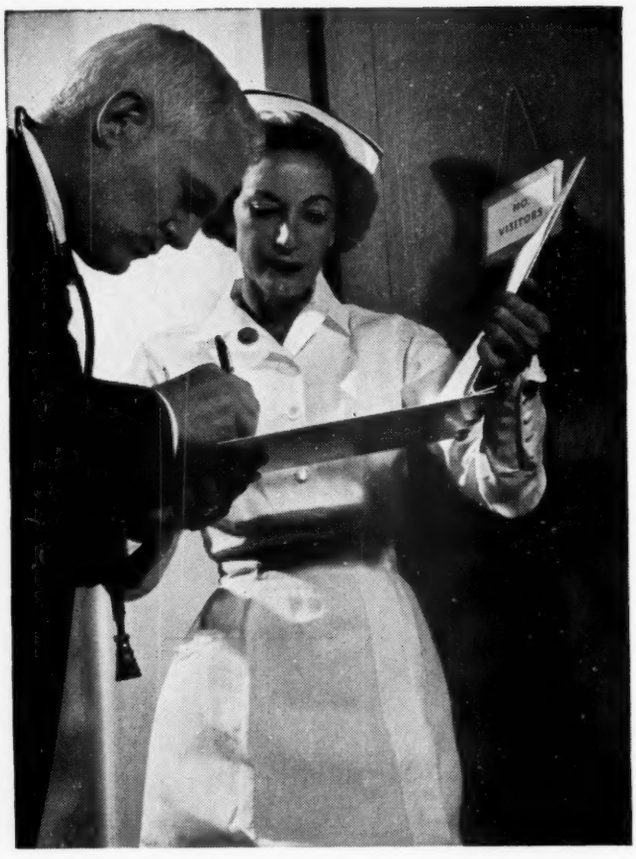
Supplied in ampuls, tablets and as a syrup.

Write for comprehensive illustrated brochure describing the action and uses of Adrenosem Salicylate.

**U.S. Patent 2,581,850*

The S. E. MASSENGILL company BRISTOL, TENNESSEE

NEW YORK KANSAS CITY SAN FRANCISCO



For safer bowel surgery

SULFASUXIDINE

SUCCINYLSULFATHIAZOLE

There is less danger of infection following bowel surgery when SULFASUXIDINE is used before and after operation. Minimal absorption of SULFASUXIDINE means maximum local bacteriostatic action in the gut. Flatus is reduced, recovery is smoother. Exceptionally well tolerated. In chronic and acute colitis SULFASUXIDINE is a valuable adjunct to other therapy.

MSD

MERCK SHARP & DOHME

DIVISION OF MERCK & CO., INC., PHILADELPHIA 1, PA.

for pre- and post-anesthetic sedation

• IN SURGERY • IN OBSTETRICS

To relieve apprehension

To control nausea and vomiting

To promote light sleep

To reduce anesthetic, narcotic, and analgesic requirements

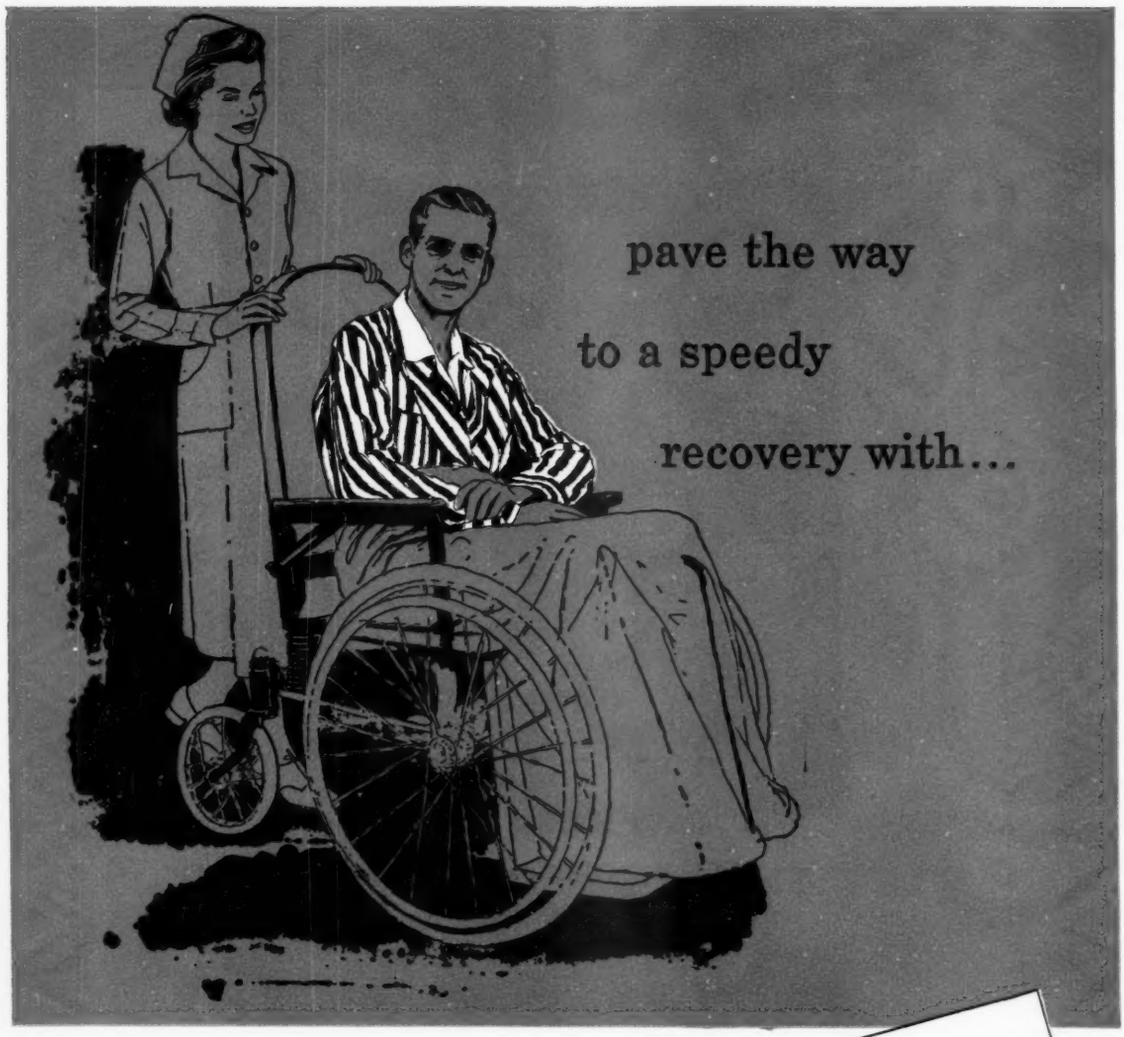
Injection

PHENERGAN®

HYDROCHLORIDE

Promethazine Hydrochloride

Philadelphia 1, Pa.



600024

'Pancebrin'

(MULTIPLE VITAMINS, INJECTABLE, LILLY)

Lilly

QUALITY / RESEARCH / INTEGRITY

Ready-to-use parenteral multivitamins for the debilitated or surgical patient

'Pancebrin' is a sterile, stable solution of essential vitamins. It is especially recommended before and following surgery and for patients who cannot take food by mouth because of anorexia, nausea, or vomiting. 'Pancebrin' is ready for use intramuscularly, or it may be added to dextrose or saline solutions for intravenous infusion.

Each 2 cc. (usual daily dose) contain:

Thiamin Chloride	10 mg.
Riboflavin	2 mg.
Pyridoxine Hydrochloride	3 mg.
Pantothenic Acid	3 mg.
Nicotinamide	20 mg.
Ascorbic Acid	60 mg.
Alphatocopherol	2 mg.
Vitamin A Synthetic	10,000 U.S.P. units
Vitamin D Synthetic	1,000 U.S.P. units

Available in 2-cc. and 10-cc. ampoules.

80TH ANNIVERSARY 1876 · 1956 / ELI LILLY AND COMPANY

The American Journal of Surgery

VOLUME 92 NOVEMBER 1956 NUMBER FIVE

PRESIDENTIAL ADDRESS

Education of the Physician

At the time of the origin of The American Proctologic Society in 1899, Proctology as a specialty was practically non-existent and some of it was in the hands of irregular practitioners. The original founders practised by their own efforts and were perforce mostly self-trained in their specialty.

Since the founding of the Society, it has grown into one of the great national specialty organizations. Through constant changes in requirements, incentive has been furnished toward the formation and maintenance of high standards, which have increased as our knowledge has increased. The educational aims of the Society have been partially fulfilled by the annual meetings, reviews of the literature and publication of scientific papers in the Transactions. The Society and its members have been of assistance in forming the Section on Proctology of The American Medical Association and The Southern Medical Association. The formation and accreditation of The American Board of Proctology is due directly to the efforts of several past presidents, supported by the Society as a whole. Preceptorships and residencies, rather than grants of money, have been organized and the advanced training of future proctologists is being accomplished by these means largely by members of the Society. This much has been and is being performed.

A cursory examination of the history of Proctology and of The American Proctologic Society immediately brings to light the rapid and profound progress which has now been steadily maintained for many years. At the present time we do not appear to need a special stimulus toward scientific progress.

I should like, however, to call your attention to the most basic portion of the education of a specialist. We are physicians before we are specialists and our primary function is to heal the sick. But a patient is more than a body of protoplasm whose physical and chemical balances have become deranged. He has a mind and emotions, and the benefit which he should receive from our ministrations is dependent not only upon his confidence in the technical ability of his physician but also upon his feeling that he is under the care of a wise and understanding fellow being. I believe that it is possible to improve these qualities by means of proper educational background.

The educated man of preceding generations received in his formal schooling a large admixture of the so-called humanities, so that he appeared—and was—more of a learned man. He had studied the philosophies, thoughts and achievements of the thinkers of the past, thus adding to his theoretic understanding. In the case of the physician, his contact with the daily problems of living of his patients in the course of his practice increased his practical understanding and to that he added the scientific understanding available in his day. The purpose of all education is understanding and if we should like to plan our advance in all three fields, it will be necessary to revive in some degree and in some manner the background of liberal arts education which we have tended to minimize for the past few decades.

If our educational institutions are to focus their efforts principally on the imparting of facts designed to enable the student to earn a living, then they are trade schools and their

graduates will have the thinking habits of artisans. Knowledge does not create wisdom and, in particular, knowledge of a trade is insufficient equipment for solving the problems of ailing humanity.

Philip E. Dobson, President of Canisius College, said recently, "To a very large extent educational authorities forgot that education does not consist in the mere assimilation of facts. They failed to realize that a specialist without the foundation of a broad liberal education is an incomplete person, who is incapable of taking his place in society as a balanced, mature, level-headed citizen whose scale of values, powers of perception and ability to see issues contributes to the common-weal."

In 1953 the Sub-Committee on Preparation for Medical Education in the Liberal Arts College, in its report, stated that "vocationally and technologically we are the wonder of the world, but if measured by the demand for high character, political fitness and acquaintance with the past, broad sympathies and a disinterested understanding of the springs of human action, we have fallen far short of our potentialities. The social, political and esthetic incapacities of the person without a balanced education, and trained only in the technics of his work or profession is likely to be appalling."*

Even the hard-headed business corporations have begun to comprehend some of these truths. At least one is sending its younger executives back to school for full-time study, not of business methods or scientific technics, but of literature, art, history and philosophy. It has been discovered that men trained only as craftsmen are "single-minded, unimaginative and lack breadth, vision and grasp to meet great challenges." Clear thinking can hardly be better cultivated than by the exercise of discussion and criticism of the world's great thinkers and the differences among them. A mental struggle to comprehend and weigh the utterances which are the results of a lifetime of thought by the greatest minds the world has known, can hardly fail to improve the thinking habits of the student, and must compel at least an effort toward lucid mental habits and expression.

* By permission from "Preparation for Medical Education in the Liberal Arts College" by Severinghaus, Carman and Cadbury. Copyright 1953, McGraw-Hill Book Co., Inc.

Even a study of the works of the political and social scientists (Machiavelli, Sorel, Michel, Mosca, Pareto) tends to give an understanding, not necessarily of the manner in which society should function, but certainly of the manner in which it does function. Who will say that such understanding is not of benefit to the physician?

I would not decry the importance of a mastery of technic; it is a *sine qua non*. I would suggest, however, that this is properly the concern of postgraduate training in internships and residencies. The time spent in medical school should be utilized in the assimilation of the great body of scientific knowledge necessary for the student in these times, and the technics of specialty practice left for formal residency training.

Such a program takes into account the basic education necessary to a theoretical understanding as well as the technical training necessary to a scientific understanding, but omits consideration of training in the practical understanding of human problems and living. It is doubtful whether any better training in such practical understanding has ever been devised than that received by the general practitioner in his daily work. His unrivalled, intimate contact with the lives, troubles, living conditions and psychologic reactions of his patients in their homes appears to provide an almost ideal training ground.

Theoretically, the problem is simple enough. Merely enlarge the undergraduate curriculum to compel the more advanced study of philosophy, history, literature, the arts and the ancient languages upon which ours is based. To this add adequate scientific medical studies, several years of general practice, and several years of specialty training and experience. While the life span of man is still approximately three score years and ten, the impracticality of such an ideal program is manifest. Rather than abandon the ideal, however, it should be possible to compromise, although only to the extent necessary. It may be possible, for example, to abrogate the last six months of medical school in favor of an organized preceptorship with a general practitioner able and willing to teach. Such a preceptorship could be continued for an additional six months following a one year rotating internship and prior to starting specialty training. By such a plan, only six months

would actually be added to the training period and I am convinced that a more than commensurate benefit would be obtained.

I am not so naïve as to believe that this address will by itself accomplish any alteration in the present curricula of our universities nor in the higher training of specialists. It is my hope, however, that the views expressed here may come, probably in modified form, to be held by enough physicians so that in the fullness of time some progress may be made, and the modern physician and specialist can again be looked upon not only as a superior dispensing scientist but as an educated man.

STUART T. ROSS, M.D.,
Garden City, New York

Pneumatosis Cystoides Intestinalis

J. EDWIN ALFORD, M.D., *Buffalo, New York*, GIOVANNI GALLETTI, M.D., *Bologna, Italy*, AND GORDON J. CULVER, M.D., *Buffalo, New York*

From the Departments of Proctology, Surgery and Radiology, Buffalo General Hospital, Buffalo, New York.

THE disease entity, pneumatosis cystoides intestinalis, was rather forcefully brought to our attention through an error in diagnosis. One of the patients to be described herein came to the Buffalo General Hospital outpatient department with bowel complaints, and during a routine sigmoidoscopic examination a clinical diagnosis of multiple adenomatosis of the lower bowel was unequivocally made. To our surprise the biopsy specimen was negative, but a barium enema study gave us the diagnosis. We believe this is a good lesson for those who sometimes hurriedly tend to rely upon clinical diagnosis of colonic lesions as seen through the sigmoidoscope and those who also do not follow this examination with roentgenography of the entire large bowel. The diagnosis of pneumatosis cystoides intestinalis is usually made by the roentgenologist by barium enema examination.

This condition has been described in adults as well as in children. The most common place in which it is found is the colon, followed in frequency by the terminal ileum, jejunum and duodenum.

Several theories have been advanced in the literature as to the etiology of this condition.

REVIEW OF LITERATURE

DuVernoi[11] probably wrote the earliest report about this subject. He described quite completely a patient observed at autopsy, reporting pathologic findings which later were accepted as characteristics of the condition. His paper also contains theoretic considerations as to the possible pathogenesis of this disease. In 1747 Combalusier[8] discussed in full the anatomic-pathologic aspects of the lesion. Cloquet[7] in 1820 reported the second case in the literature, also discovered at autopsy. He discussed the case and compared it with similar lesions seen in swine. Some authors rejected the cases reported by DuVernoi and Cloquet as examples of "putrefactive emphysema," but apparently the two autopsies were done immediately after death.

The third case published was by Bang[1] in 1876. In recent literature this case has been erroneously considered as the first published case. Bang cited the two cases of DuVernoi and Cloquet, but his case was the first in the literature with illustrations showing the macroscopic and microscopic appearances of the gaseous cysts. He also discussed the pathogenesis, trying to give a satisfactory explanation of the causative mechanism. Meyer[28] was the first to use the term "pneumatosis cystoides intestinalis." In 1882 Marchiafava[23] reported such a case and described, among other things, cysts which contain a clear fluid.

From this point on, the interest in the subject increased and the number of reported cases became more frequent. In 1904 Ciechanowski[5] collected twenty cases from the literature. In 1913 Turnure[43] collected fifty cases. In 1921 Barbosa[2] collected seventy-one cases. In 1940 Jackson[18] collected 171 cases, and in 1952 Koss[22] found 213 cases. The first case reported in the American literature was described by Finney[14] in 1908.

PATHOGENESIS

The problem of the pathogenesis of this disease is still in doubt. Five theories have been propounded to explain this phenomenon: (1) mechanical, (2) bacterial, (3) chemical, (4) nutritional and (5) neoplastic.

Mechanical Theory. This is the theory to which a large number of the authors have adhered.[3,16,30,36,39,41,42,44,45] In general it is stated that a total or partial obstruction in the gastrointestinal tract produces a great amount of gas which, under the pressure of the increased peristaltic waves, might be forced through the gastric or intestinal mucosa. Little cysts filled with gas also form in the submucosa and subserosal tissues. The cause of obstruction is not always the same. Koss,[22] Schweitzer[37] and Heydemann[17] state the gas from the gastrointestinal lumen penetrates the bowel mucosa through gross or microscopic mucosal defects and goes into the tissue spaces probably following the lymphatic channels. Others say the gas penetrates the intestinal mucosa through pre-existing ulcerations. Stiennon suggested that after the gas had passed the intestinal mucosa, under pressure, it may travel in the mesentery. This explains the rather frequent findings of gas cysts at a considerable distance from the point of entrance, as in a peptic ulcer. Burnett and Williams[4] very recently described a case in which they found air bubbles in the mesenteric veins as well as cysts in the walls of the stomach, duodenum and jejunum. In reviewing the literature, Koss found that 53 per cent of the cases published occurred in the presence of an obstruction of the pylorus due to a peptic ulcer. Tung and Ngai conducted a series of experiments in dogs in which they surgically produced pyloric ulceration, mechanical obstruction distally and, by inflating the stomach with air, produced air bubbles in the lymphatics of the serosa of the stomach and in the omentum.

Bacterial Theory. Several authors have thought that gas-producing microorganisms penetrate the submucosal or subserosal tissues of the intestine, producing gas cysts and the picture of an acute inflammatory process. Dupraz,[10] Steidl,[40] Jaeger[19] and Hahn[15] obtained positive cultures of microorganisms from gas cysts.

Nitch and Shattock[34] reported two cases in which no bacteria were found. However, the microscopic characteristics of the second case were those of an acute inflammatory process involving the muscularis as well as the submucosa.

Chemical Theory. This theory is based upon the fact that gases can be absorbed by the mucous membrane of the intestine under certain circumstances. McIver, Redfield and Benedict,[27] in their experiments on cats, have found that in a unit of time, the quantity of gas which diffuses through the mucous membrane of the intestine is directly proportional to the difference in partial pressure on the two sides of the mucous membrane in the area tested but inversely proportional to the thickness of the mucous membrane. They found that carbon dioxide diffuses rapidly, oxygen more slowly and nitrogen very slowly if at all. Similar results have been obtained by Pogrund and Steggerda in man.[46]

TABLE 1

	Carbon Dioxide (%)	Oxygen (%)	Nitrogen (%)	Hydrogen (%)
Intestinal gas..	40.0	0.5	45.0	14.0
Krummacher...	0.3	10.0	85.0	0.0
Urban.....	4.0	15.4	80.0	0.6
Jaeger.....	15.0	5.0	6.1	73.0

Oxygen and carbon dioxide are absorbed by the blood stream chemically combined. Oxygen as oxyhemoglobin and carbon dioxide as sodium bicarbonate or potassium bicarbonate, or both, are catalyzed by the enzyme carbonic anydrose.[38] If a state of acidosis is present due to a marked increase in lactic acid, subsequent to a particular dietary regimen, the absorption of oxygen and carbon dioxide by the blood stream does not occur and these gases remain within the tissues of the intestinal wall.[47]

Masson made the suggestion that in the presence of intestinal fermentation, carbon dioxide is absorbed in the lymphatic channels and dissolved in the lymph to a point of saturation. Because of the slow circulation of the lymph the gas is blocked in the lymphatics and forms cysts. Severi agrees with Masson on the importance the lymphatic channels play in the absorption and diffusion of the gas. He suggests the term "pneumocystic lymphopathy."

FIG. 1. Case 1. Barium enema showing gas cysts.

FIG. 2. Case 1. Barium enema after disappearance of gas cysts.

The combination of the gas found in the cysts has been studied by various authors with different results. (Table 1.)

Alimentary Theory. This theory resulted from experiments and observations made by veterinarians[13] on animals. The authors state that these animals showed emphysematous manifestations in the intestine after a more or less lengthy period of a deficiency diet. The manifestations disappeared after the animals were put back on a normal diet.

Neoplastic Theory. Bang and Finney thought that tumor cells were responsible for the formation of the gas. They also thought that under the influence of giant cells the lymph could be transformed into gas. Apparently this theory did not find very many enthusiastic followers as it is rarely mentioned by other authors writing on this subject.

CASE REPORT

CASE 1. Mrs. I. C., a seventy-four year old white woman, had been a guest at the Wheel Chair Home since 1950. She came to the Outpatient Department of the Buffalo General Hospital on July 12, 1955, with complaints of constipation alternating with diarrhea with occasional bloody mucus. She stated that the symptoms started early in May, 1955, without any evident reason. At times there was rectal pain not associated with bowel movements. She denied having abdominal cramps. There was no history of vomiting, hematemesis, nocturnal pain or specific food intolerance. She stated, however, that occasionally she had slight epigastric preprandial pain which was relieved by meals, and at times acid eructations which were not in relation to the epigastric pain and were relieved by bicarbonate of soda. She also said that she felt tired all the time. In June, 1954, she was examined by the nursing home physician who discovered that she had a high degree of anemia, with a hemoglobin of 40 per cent. She was treated with iron and liver extract, and a few months later the hemoglobin was 60 per cent.

At the time of her visit to our Outpatient Department the hemoglobin was 60 per cent. There was nothing of significance in the past or family history. Sigmoidoscopic examination was performed the same day and revealed what appeared to be little sessile adenomas. On the top of a few of these intramucosal hemorrhage was noted. The size of these lesions varied from 2 to 3 mm. to 2 cm. They were disseminated on the rectal mucosa without any characteristic disposition, and were seen as far as 19 cm. proximal to the anus. The diagnosis at that time was multiple adenoma-

FIG. 3A. Case II. Operative specimen showing large gas cysts through the serosa.

FIG. 3B. Case II. Section of wall of sigmoid colon showing large cysts with hemorrhage.

tosis. Biopsy specimens were taken from two of these lesions. The pathologic report was normal rectal mucous membrane. One week later x-ray studies by means of fluoroscopy and a barium enema were carried out. (Fig. 1.) These showed a moderate amount of gas scattered along the course of colon from the mid-transverse section to the rectosigmoid junction. Upper gastrointestinal studies showed that the duodenal bulb was grossly deformed, with what appeared to be a crater of ulceration. The roentgenologic diagnosis was duodenal ulcer and pneumatosis cystoides intestinalis.

On August 23, 1955, she was re-examined. A barium enema on the postevacuation film revealed only a very few small radiolucent areas in relationship to the splenic flexure of the colon. (Fig. 2.) This was interpreted as the only residual of the intestinal emphysema described in the previous films. On August 23, 1955, gastrointestinal studies showed no evidence of ulceration. No deformities were evident in the duodenum. At re-examination on August 26th the patient reported that the symptoms present at the time of the first visit had disappeared.

Sigmoidoscopic examination on August 29, 1955, showed no evidence of ulceration or new growth and no blood was seen coming from above. The previously described lesions had completely disappeared.

CASE II. M. B., a forty-five year old white woman, was admitted to the Buffalo General Hospital on March 2, 1955, with a history of bloody diarrhea since December, 1954. Physical examination was essentially negative. Sigmoidoscopic examination failed to reveal any disorder, although malignancy or a polyp were considered. Stool examinations for occult blood were 4 plus on two occasions. Blood tests and urinalysis were normal. X-ray examination by means of barium enema showed that multiple small filling defects were evident in the descending and transverse colon. At this time it was believed that these probably represented fecal contents. However, repeated studies were made without evidence of specific filling defects. The patient was discharged unimproved after three days of hospitalization with the diagnosis of "bleeding from bowel of undetermined origin."

The patient was readmitted to the Buffalo General Hospital on March 8, 1955, with the same complaints. Sigmoidoscopic examination was again

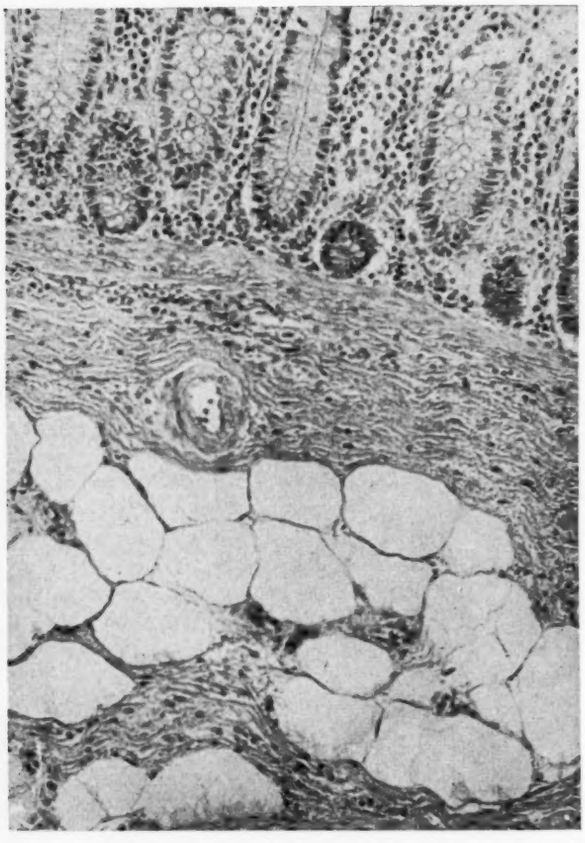


FIG. 4. Case II. Photomicrograph showing gas in the muscularis.

carried out and remained negative. A gastrointestinal series with barium enema was made, which was not diagnostic. Blood studies were negative and stools again revealed the presence of occult blood. The patient was discharged after four days with the same diagnosis as that made previously.

The patient again was readmitted to the Buffalo General Hospital on September 10, 1955, with the same complaints plus nausea. She had had x-ray studies of the colon made elsewhere and the diagnosis of pneumatosis cystoides intestinalis was made. This time she was admitted for surgery. Physical examination was essentially negative and laboratory studies were negative.

At operation the entire small bowel from the ligament of Treitz to the ileocecal valve was normal. The cecum itself was not involved, but just proximal to the ileocecal area and extending up along the ascending colon, hepatic flexure, transverse colon, splenic flexure and descending colon down to the upper sigmoid was a very peculiar involvement of the large bowel; this consisted of multiple lobulated blebs scattered throughout the entire extent of the involved colon. Along the under surface of the transverse colon itself were multiple, small grape-like blebs which greatly resembled the gross appearance of a chorionic epithelioma. (Fig. 3A and B.) A needle was inserted into one of these blebs, only revealing the presence of air. The bleb was opened and noted to be dry. Regardless of this finding, cultures were taken. In view of the aforementioned findings and the patients clinical symptoms, total colectomy and ileosigmoidostomy were performed.

The pathologic report was as follows: Sections throughout the ascending, transverse and descending colon showed formation of large cysts in the submucosa as well as in the subserosa, with the cysts lined by foreign body giant cells. The wall of the cysts was very thin and fibrous and there were focal areas of inflammation around the cysts. The inflammatory cells consisted of lymphocytes, plasma cells, eosinophils and a few neutrophils. In the same areas there were very tiny cysts with no recognizable lining, and in the cecum there was a very small cyst with slight inflammation in one point. (Fig. 4.) The bacteriologic report of the cultures was negative. After seventeen days of uneventful recovery the patient was discharged.

COMMENTS

It is interesting from the standpoint of differential diagnosis that in Case I we made a diagnosis of diffused adenomatosis of the rectum and lower sigmoid colon on the original sigmoidoscopic examination. The small gas cysts greatly resembled multiple small sessile adenomas arising from the mucosa of the lower bowel. Biopsy specimens from two of the cysts revealed normal mucosa. Following the sigmoidoscopic examination the patient was sent to the radiologist for a barium enema study of the large bowel to determine the extent of involvement of the colon by the previously described adenomas. Both by fluoroscopy and examination of the x-ray plates the radiologist made a diagnosis of pneumatosis cystoides intestinalis.

In Case II the barium enema on the first examination showed what was interpreted as multiple small filling defects likely to be fecal contents. Later a barium enema examination revealed definite gas cysts. It is reasonable to suppose that the small filling defects seen at the first examination represented small gas cysts within the wall of the colon.

Because of the popularity of the mechanical theory in the literature it was thought that the patient in Case I fulfilled all the criteria represented in this theory, namely, a history of previous upper gastrointestinal distress combined with x-ray evidence of a duodenal ulcer

and the finding of gas cysts by barium enema studies. This was further supported by the fact that both by clinical examination and by sigmoidoscopic and x-ray examination there was a gradual disappearance of the lesions in the colon which was preceded by a disappearance of the duodenal ulcer as judged by x-ray examination. Also, as the cysts disappeared by direct and x-ray examinations there was a concomitant decrease in the symptoms described by the patient. In Case II, however, x-ray examination, including upper gastrointestinal studies, failed to prove the presence of ulceration in the gastrointestinal tract as a point of entrance of gas. This case does not support the mechanical theory.

A review of the symptomatology of both patients reveals that each presented diarrhea, flatulence and abdominal distress which probably are a consequence of increased fermentation within the large bowel and a consequent increase in lactic acid and gas-forming bacteria. This situation leads us to consider with much interest the role played by the chemical theory versus that of the mechanical theory in the formation of the cysts.

It would seem in these cases that there is an alteration in the normal physiology of the absorption of gases by the blood stream and they remain within the wall of the intestine. These gas bubbles within the intestinal wall act as foreign bodies. The surrounding tissue reacts, forming giant cells and connective tissue which encapsulates them. These are the gas cysts.

The pH of the tissues of the wall of the intestine governs the exchange of gases between the lumen of the bowel and the blood stream. It is an alteration, we believe, in the pH that is the determining factor in the causation of this disease. Other factors, however, have to be considered, namely, a change in dietary habits, an increase in the number of gas-forming bacteria and probably a particular predisposition of the intestine, which play as much a part in the etiology as the first factor mentioned.

This process would seem to be reversible due to the fact that when the acid medium disappears and the normal physiology is reestablished, the gas is reabsorbed and the cysts disappear, as is shown in our cases.

This would lead to the conclusion that gas does not travel through the lymphatics from a distant point and that the presence of an ulcer is merely coincidental.

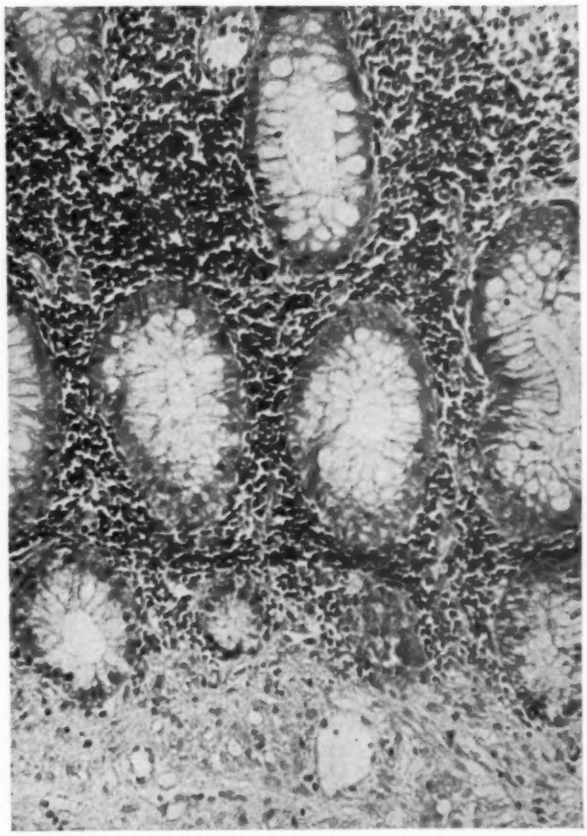


FIG. 5. Case II. Photomicrograph showing hemorrhage in mucosa over a gas cyst.

In both cases bleeding was the prominent symptom, and sigmoidoscopic examination in the first patient showed areas of hyperemia and mucosal hemorrhage on the dome of the cysts. (Fig. 5.) This apparently is secondary to the increased pressure from the gas in the cystic cavity upon the overlying mucous membrane.

SUMMARY

1. A review of the literature of pneumatosis cystoides intestinalis together with a review of the different etiologic theories is presented.
2. Two cases of the disease are reported.
3. Comment emphasizes the fact that the formation of the gas cysts cannot be explained by one theory alone but by a combination of different factors, namely, physical, chemical, bacterial and probably alimentary.

REFERENCES

1. BANG, A. Luftholdige Kyster i vaggen af ileum og i ny dannet bidevav pa sammes seros. *Nord med. Ark.*, 1: 16, 1876.

2. Barbosa, J. M. La pneumatosis quistica dell'intestino. *Med. Iberia*, 15: 217, 1921.
2. Bubis, J. L. and Swanbeck, C. E. Gas cysts of the intestine. *Ann. Surg.*, 75: 625, 1922.
4. Burnett, W. and Williams, A. W. Intestinal pneumatosis associated with acute dilatation of the stomach. *Brit. J. Surg.*, 43: 68, 1955.
5. Ciechanowski, S. Pneumatosis Cystoides Intestinorum. *Wien. med. Wchnschr.*, 1: 24, 1904.
6. Ciechanowski, S. Pneumatosis Cystoides Intestinorum. *Virchow's Arch. f. path. Anat.*, 203: 170, 1911.
7. Cloquet, J. Emphyseme du tissue cellulaire qui réunit les tuniques de l'estomac. *Bull. Fac. Med.*, 8: 267, 1820.
8. Combalusier, F. de P. Pneumo-pathologia seu tractatus de flatulentis humani corporis affectibus, p. 17, Paris, 1747.
9. Deutch, K. Cystic pneumatosis of bowel. *Wien. med. Wchnschr.*, 47: 2218, 1901.
10. Dupraz, A. Gaseous cysts of intestine. *Arch. de méd. expér. et d'anat. path.*, 9: 282, 1897.
11. DuVernoi, G. J. Aer intestinorum tam sub extima quam intima tunica inclusus: observationes anatomicae. vol. 5, p. 213. Academiae Scientiarum Petropolitane, 1730–1731.
12. Elemberg. Reported by Nitch.[33]
13. Eveleth, D. F. and Biester, H. E. Further studies on intestinal emphysema of swine. *Am. J. Hyg.*, 27: 364, 1938.
14. Finney, J. M. T. Gas cyst of the intestine. *J. A. M. A.*, 51: 1291, 1908.
15. Hahn, E. Ueber die pneumatosis cystoides intestinorum hominis und einen durch laparatomie behandenten fall. *Deutsche med. Wchnschr.*, 25: 657, 1899.
16. Hey, R. Pneumatosis cystoides intestinalis in man. *Deutsche Ztschr. f. Chir.*, 154: 250, 1920.
17. Heydemann, A. Pneumatosis cystoides intestini. *Arch. f. wissensch. u. prakt. Thierh.*, 30: 423, 1904.
18. Jackson, J. A. Gas cysts of the intestine. *Surg., Gynec. & Obst.*, 71: 675, 1940.
19. Jaeger, E. Das intestinal emphysema der suiden. *Arch. f. wissensch. u. prakt. Thierh.*, 32: 425, 1906.
20. Jamanouchi, I. Pneumatosis cystoides intestinalis. *Verhandl. d. Japan. Gesellsch. f. Chir.*, 1909.
21. Krummacher. Reported by Nitch.[33]
22. Koss, L. P. Abdominal gas cysts (pneumatosis intestinorum hominis). *Arch. Path.*, 53: 523, 1952.
23. Marchiafava, G. Pneumatosi cistica dell'intestino. *Arc. Ital. Biol.*, 1: 429, 1882.
24. Martini, E. Pneumatosis intestinale dell'intestino. *Giorn. d. r. Accad. med. Torino*, 34: 129, 1910.
25. Masson, P. La lymphopneumatose kistique. *Ann. d'anat. Path.*, 2: 541, 1925.
26. Masson, P. Gas cysts on intestines. *Rev. méd. de la Suisse Rom.*, 45: 470, 1925.
27. McIver, M. A., Redfield, A. C. and Benedict, E. B. Cited by Pogrund and Steggerda.[46]
28. Meyer, A. F. Pneumatosis cystoides intestinorum. *J. d. pract. Heilk.*, 61: 67, 1925.
29. Miyake, K. Cystic emphysema of the bowel. *Arch. f. klin. Chir.*, 95: 437, 1911.
30. Mori, K. I. Cystic pneumatosis; two cases. *Arch. f. Jap. Chir.*, 17: 147, 1940.
31. Mori, M. Ein fall von pneumatosis cystoides intestinorum hominis. *Deutsche Ztschr. f. Chir.*, 37: 553, 1917.
32. Nigrisoli, B. Sulle Cisti gassose dell'intestino umano. *Nuovo Raccoglitore Med.*, 1: 385, 1902.
33. Nitch, C. A. R. Cystic pneumatosis of the intestinal tract. *Brit. J. Surg.*, 11: 714, 1924.
34. Nitch, C. A. R. and Shattock, S. S. Diffuse enfisema of the intestinal wall (two cases) with remarks upon pneumatosis. *Proc. Roy. Soc. Med., London*, 12: 46, 1919.
35. Rubis, J. L. and Swanbeck, C. E. Gas cysts of intestines. *Ann. Surg.*, 75: 620, 1922.
36. Schorr, G., Ullman, T. D. and Lamper, G. Pneumatosis cystoides intestinalis. *Arch. Int. Med.*, 88: 362, 1951.
37. Schweitzer. Cited by Turnure.[43]
38. Severi, L. Trasformazione pneumocistica nel fondo dell'ulcera gastrica e pneumatosi del duodeno. *Arch. de Vecchi*, 2: 905, 1940.
39. Sloan, H. S. Gas cysts of the intestine. *Surg., Gynec. & Obst.*, 30: 389, 1920.
40. Steidl, H. Gas cysts in the abdomen. *Deutsche Ztschr. f. Chir.*, 163: 44, 1921.
41. Stiennon, O. A. Pneumatosis intestinalis in new born. *Am. Dis. Child.*, 81: 651, 1951.
42. Thorburn, W. Pneumatosis intestinalis cystica. *M. Chron.*, 4: 255, 1902–1903.
43. Turnure, P. Gas cysts of the intestine. *Ann. Surg.*, 57: 811, 1913.
44. Tung, P. C. and Ngai, S. K. Gas cysts of the intestine. *Chinese M. J.*, 47: 1, 1933.
45. Urban, K. Intestinal pneumatosis. *Wien. med. Wchnschr.*, 60: 1750, 1910.
46. Pogrund, R. S. and Steggerda, F. R. Influence of gaseous transfer between colon and blood stream on percentage gas compositions of intestinal flatus in man. *Am. J. Physiol.*, 153: 475, 1948.
47. Ferrandu, S. Studio Anatomo-patologico e interpretazione patogenetica della pneumatosi intestinale cistica. *Arch. per le sc. med.*, 60: 493, 1935.

DISCUSSION

Raymond J. Jackman (Rochester, Minn.): Although almost 260 cases of this disease in man have been reported, less than fifty cases have been authenticated. The disease occurs in animals as well as man and is supposedly not uncommon in swine.

As far as I can tell from a fairly careful review of the literature, there are reports of fewer than a dozen patients in whom the condition involved the large intestine, and of these there were only six in whom the lesions were described on sigmoidoscopic examination. This examination was made to confirm an x-ray diagnosis in all but one of the six patients.

During the past year, as Chairman of the Committee on Scientific Programs for this organization, I have received all the manuscripts of papers that were to be considered for presentation at this particular meeting. The title of Dr. Alford's paper intrigued me because I had never heard of the condition, and I read the manuscript with great

interest and curiosity. About a week later a patient, whom I had examined proctoscopically three times in the preceding year because of rectal bleeding, returned because of continued passage of a small amount of bloody mucus with each stool. Previous proctoscopic examination had disclosed submucosal lumps that extended distally as far as the lower part of the sigmoid. The lumps measured 2 by 2 or 3 cm., and the mucosa overlying them bled more readily than normal. The lesions were thought probably to be lymphoid tissue. A biopsy specimen was reported to be inflammatory mucous membrane.

At the present visit I commented to my assistant that even though these lumps were above the peritoneal reflection we perhaps had been too timid in our previous removal of a biopsy specimen and that this time we should bite deeper and hope to get tissue that was diagnostic. This was done and the lump disappeared. The procedure was repeated on another lump and it, too, vanished. We then thought of Dr. Alford's paper and it occurred to us that we were dealing with pneumatosis cystoides intestinalis. What we had done was to make a hole in the cyst, thereby deflating it.

On reviewing the observations made on x-ray examination of the colon on two occasions in the preceding year in this patient, we found that "large adenomatous polyps involving the entire colon" had been reported by the roentgenologist. In restudying the old films in the light of the most recent proctoscopic report, the roentgenologist reported "radiolucent shadows or filling defects along the entire colon consistent with pneumatosis cystoides intestinalis."

About a week later my associate, Dr. W. G. Smith, asked me to see with him a patient who presented an almost identical picture through the proctoscope. The condition had been diagnosed elsewhere and confirmed by x-ray evidence. The main complaint of this patient too was rectal bleeding.

The fact that we saw two patients with this relatively rare and interesting entity within a short time after it was brought to our attention by Dr. Alford's paper makes me wonder whether the condition is not more common than is generally believed.

A. W. Martin Marino (Brooklyn, N. Y.): I want to compliment the essayists on their excellent photograph of a bowel laid open with gas cysts so plainly shown and which greatly resembled polypi.

The forty-fifth authentic case of this condition to appear in the American literature was reported by Carter and Wilson in the February, 1955 issue of *Surgery*.

To the best of my knowledge these two cases and Dr. Jackman's case added to the forty-five total forty-eight such cases. We observed a patient whose history was presented to the Brooklyn Surgical Society last April and, as far as I know, that was the forty-ninth authentic case described in the American literature. I believe Dr. Jackman's case has been or will be reported.

The published reports of these conditions appear under a variety of names, and perhaps that is where the confusion may arise. I heard again of this condition through the Examinations Committee of the American Board of Surgery, as did a good many of the applicants to the Board. The question was asked, "What is pneumatosis cystoides intestinalis?" Surprisingly, more than 90 per cent of the applicants answered the question correctly. So, although this condition is rare, apparently our members and certainly the applicants to the Board are well read.

The condition may appear under other descriptive titles such as gas cysts of the intestine, emphysema of the intestine, emphysema of the cecum, pneumatosis intestinalis (which was the way the question was worded several years ago), and pneumatosis cystoides intestinalis (the name under which it was described in this paper).

The clinical diagnosis of pneumatosis cystoides intestinalis is quite difficult. Of the forty-five cases already in the American literature, only five were diagnosed preoperatively. Our case was also diagnosed postoperatively.

Sudden, severe abdominal pain is the leading clinical symptom, but there are other conditions which give rise to that symptom, so that unless pneumatosis is kept in mind the symptom may be attributed to other conditions which are commonly encountered such as a perforated viscus.

We seldom insert rectal tubes, and certainly never insert whistles, into the anorectum following operations in that region, but it is conceivable that in a susceptible patient (and I will say a word about this) lack of a vent for the egress of gas increases the intrarectal pressure sufficiently to produce added trauma within the tissues.

Although most of the reported cases were secondary to peptic ulcer, four were attributed to lack of egress of gas following an anorectal operation, and we know that in such cases the mucosa is traumatized.

Pneumatosis intestinalis is in itself a benign process, and the cysts may be absorbed after a short time. Surgical treatment, if necessary, should therefore be directed against the underlying disease, and there is no need for drastic resection of the cystic intestine unless obstruction (as in the second case that was reported) is caused by the condition.

It is well to keep the condition in mind so that we will be able to recognize it in the infrequent instances in which it occurs. The Program Committee is to be congratulated for including this subject.

WALTER BIRNBAUM (San Francisco, Calif.): An interesting phenomenon in medicine is the manner in which conditions or clinical entities, which had hitherto been considered rare or uncommon, at some time begin to be reported in increasing numbers. I was unaware of the fact that a paper on pneumatosis cystoides intestinalis was to be presented at this meeting and had already begun to collect a series of four authenticated and possibly five cases of pneumatosis. It is also interesting that one of these occurred in the rectum, which makes the seventh case to have been reported.

I have been in communication with the people in animal pathology concerning the appearance of a similar disease in swine, as has been mentioned. The fact that there have been recent papers concerning the appearance of histoplasmosis in swine which is transmissible to humans might warrant further study. In histoplasmosis in swine submucosal or sometimes subserosal cysts occur, such as have been described.

ERNEST N. C. MCAMMOND (Vancouver, B. C.): I have seen two patients with this condition, and I was privileged to give a paper on it in Geneva which was printed in a Canadian journal a year ago.

The first case was not diagnosed until operation, but the second case showed the very typical radiologic appearance. There are three typical x-ray findings which give the diagnosis: (1) filling defects or dark shadows; (2) dark shadows parallel with the colon; and (3) a dark shadow within a dark shadow, the inner shadow being much darker than the other. The condition is confined usually to the right side. In the last patient I observed, the condition was in the left side of the bowel, and the diagnosis was made with the sigmoidoscope.

I was interested in the fact that my second patient had lower abdominal cramps, bleeding and the passage of mucus. As has already been stated, the condition is a benign one. It usually does not require operation, but this patient's condition was quite severe. I pricked thirty or forty of these cysts; they go off with quite a loud puff when they are pricked with the high frequency needle. It is not the same sound you get as when fulgurating a simple adenoma or polyp.

This patient's symptoms were completely relieved for about a year, but several weeks ago she returned. Lower abdominal cramps had recurred and x-rays revealed that the condition is still present. The radiologic diagnosis can certainly be made because we reviewed the case which had not been diagnosed until operation and the three criteria which give the diagnosis were present: the filling defects, the dark shadows within dark shadows, and dark shadows longitudinally along the bowel.

ARTHUR E. LEWIS (Seattle, Wash.): A thirty-two year old woman presented a history of chronic obstipation. Since prefrontal lobotomy had been performed for psychiatric illness, obstipation had become more marked, and in the patient's reversion to the juvenile state, fecal passage frequently occurred involuntarily.

At examination, an impaction was found and numerous large fecaliths could be palpated in the sigmoid through the abdominal wall. The patient was prepared for sigmoidoscopy with castor oil and enemas. On sigmoidoscopy, the normal mucosa of the rectum and lower 5 inches of the sigmoid were completely transformed into numerous bullae-like, circumscribed, mucosal swellings varying in size from 1.5 to 3 cm. in diameter and projecting .5 to 1 cm. into the lumen of the bowel. The mucosa involved was a pale, salmon pink color, with no ulceration or bleeding. The masses were easily compressible by the sigmoidoscope end and were thought to be of the nature of angioneurotic edema, possibly from the purging action of, or chemical irritation from, the castor oil.

Four days later sigmoidoscopy was again performed, revealing a normal mucosa and redundant sigmoid colon with a much greater than average diameter. The barium enema radiologic report was normal redundant, atonic colon.

Submucosal Rectal Nodules

A CLINICOPATHOLOGIC REVIEW

FRANK C. SWARTZLANDER, M.D., RAYMOND J. JACKMAN, M.D. AND MALCOLM B. DOCKERTY, M.D.,
Rochester, Minnesota

From the Sections of Proctology and Surgical Pathology, Mayo Clinic and Mayo Foundation, Rochester, Minnesota. (The Mayo Foundation is a part of the Graduate School of the University of Minnesota.) Abridgement of thesis submitted by Dr. Swartzlander to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Proctology.

SMALL submucosal nodules in the rectum are usually considered of little significance by the examining physician. However, in the past few years carcinoids have been found in the rectum with increased frequency. What should the course of action be on discovery of one of these tiny lesions? Are they malignant, potentially malignant or benign and self-limiting? The purpose of this treatise is to present a review of the literature and the results of a clinical and pathologic study of the submucosal rectal nodules which were excised surgically at the Mayo Clinic in the seven years from 1945 through 1951. An attempt will be made to evaluate the best mode of treating these lesions.

REVIEW OF THE LITERATURE

In 1944 Jackman and Buie[14] reviewed the data on forty-seven consecutive cases of submucosal rectal nodules which were encountered at the Mayo Clinic. A second report by Jackman in 1947 included eighty-seven cases.[13] The chief lesions which were encountered in both series were oleomas, hypertrophied lymphoid tissue, carcinoids, lipomas, leiomyomas and inflammatory lesions which were non-specific in their origin.

Oleomas. Oleomas of the rectum were first recognized in 1917.[15] It is now generally believed that they are the result of injection[25] or instillation[30] of mineral oil or cottonseed oil.[25] These tumors usually occur after these substances are used as a base for sclerosing solutions which are injected into the region of the internal hemorrhoidal veins. The addition of sclerosing solutions, for example, phenol, is not responsible for the reaction.[30] Microscopically, oleomas are comprised of fibrous tissue containing lymphocytes, macrophages and round or oval spaces which contain oil. Occasionally small foreign body giant cells containing oil are present.

Hypertrophied Lymphoid Tissue of the Rectum. In 1890 Ball was the first to report a lymphoid tumor of the rectum which was not associated with generalized lymphoid disease. He assumed that the growth originated in the solitary lymph follicle of the rectum. Following this, several cases were reported.[4–6,9,11,16,17,19,20,26] Li in 1948 reported twenty-three cases which involved the mucosa and submucosa of the rectum. She described the growths as made up of units of follicles with mitotic figures strictly limited to the germinal centers. If formation of giant follicles was present and limited to the mucosa and submucosa, she considered the tumors benign. Helwig and Hansen, in a review of seventy cases of "lymphoid polyps" of the rectum and anus, advocated removal and biopsy of the entire lesion. Some patients were followed up seventeen years and gave no evidence of recurrence or of generalized lymphoid disease. In Helwig and Hansen's five cases of lymphosarcoma of the rectum in submucosal nodules, palpable nodules had been discovered elsewhere in the body prior to the discovery of the rectal lesion.

Carcinoids. Carcinoid tumors of the rectum were considered to be rare prior to 1950. They are believed to originate from the endocrine (enterochrome) cells arising from the chromaffin system in the intestinal mucosa. Stout, Erspamer and Popoff stated that carcinoids of the

rectum do not reduce silver salts as do other carcinoids in the body. Buchanan, Smith and Alrich reviewed seventy-seven cases and found that carcinoids of the rectum were usually 1 cm. or less in diameter and also that they occurred predominantly on the anterior wall

TABLE 1
CLASSIFICATION AND COMPARATIVE INCIDENCE OF SUBMUCOSAL RECTAL NODULES IN NINETY-ONE CONSECUTIVE SURGICAL CASES

Classification	No. of Cases	Per cent
Hypertrophied lymphoid tissue	28	30.8
Oleoma	20	22.0
Carcinoid	16	17.5
Inflammatory lesion	11	12.1
Leiomyoma	5	5.5
Miscellaneous tumors:		
Leiomyosarcoma	1	1.1
Adenocarcinoma, grade 1	1	1.1
Lipoma	1	1.1
Foreign body granuloma	2	2.2
Cyst	4	4.4
Phlebolith	2	2.2

beneath intact mucosa. Metastasis occurred in twenty-nine (38 per cent) of their patients; distant metastasis occurred in three, and six died of metastatic lesions.

Kunkel, Dockerty and Waugh reported on a carcinoid of the rectum 1.5 cm. in diameter, with a metastatic lymph node 0.8 cm. in diameter, 3 cm. proximal to the primary lesion in the tissue removed at radical operation. This rectal lesion was situated 6 cm. above the dentate margin and showed no ulceration of the mucosa.

The "carcinoid syndrome" which is currently of scientific interest concerns carcinoids of the small bowel with metastasis. There has been no report of this interesting phenomenon associated with carcinoid of the rectum.

Leiomyomas and Leiomyosarcomas. Smooth muscle tumors of the rectum have been recognized since 1872 when Malassez first described the lesion. Since then many reports have appeared in the literature.[1,8,10,12,22,24,28,29]

Benign lesions were usually small, 0.5 to 1 cm., with intact mucosa, whereas leiomyosarcomas tended to be larger, 2 to 8 cm. in diameter, and might or might not have shown ulceration of the mucosa.

Neuman repeatedly biopsied a submucosal tumor of the rectum over a period of seven years. Originally it was a typical leiomyoma on microscopic examination and finally a leiomyosarcoma.

METHODS OF STUDY

All cases in which submucosal nodules were removed surgically from the rectum at the Mayo Clinic from 1945 through 1951 were reviewed. The original specimens were studied and fresh sections were made of any lesions about which there was any doubt as to diagnosis. In this group of ninety-one cases the clinical and pathologic findings were reviewed and tabulated. Follow-up letters were sent to all patients who had been given the diagnosis of carcinoid tumor. The classification and incidence of the various conditions found are given in Table 1.

LYMPHOID HYPERPLASIA

Lymphoid hyperplasia in our series affected women about five times more often than men. The average age of the men was 50.4 years; the youngest was nineteen and the oldest sixty. The average age of the women was forty-seven years; the oldest was sixty-five and the youngest nineteen.

Proctoscopic observations on twenty-nine patients with submucosal nodules revealed that all nodules were within 8 cm. of the dentate margin, that 60.7 per cent were located on the anterior wall and that 32 per cent were multiple lesions. The average size of the lesions was 1.5 cm. in diameter; the smallest measured 3 mm. in diameter and the largest was 4 by 2.5 cm. Thirty-five per cent of the lesions were not symmetric. In 21 per cent the size and shape were not given; the records stated only that a submucosal nodule was present.

Four lesions were found on rectal examination by the patient's physician in the home locality. The remainder were found at proctoscopic examination at the clinic. The symptoms complained of seemed to bear no relation to the lesions found. Reasons for proctoscopic examination were hemorrhoids, bleeding from rectum, pain in abdomen, diarrhea, constipation and rectal soreness. No patient had generalized lymphoid disease. Two patients gave a history of injection therapy.

Grossly, all lesions were covered with rectal mucosa. There was no ulceration of the mucosa. All lesions were firm to palpation except one

FIG. 1. Submucosal lymphoid nodule as seen after surgical excision.

FIG. 2. Mounted microscopic section of a submucosal nodule lying for the most part under the muscularis mucosa. Hematoxylin and eosin, original magnification × 4½.

which was thought to be a cyst. No specific color was noted in the intact lesion. (Fig. 1.)

Microscopically, all sections showed lymphoid hyperplasia with follicle formation and reaction centers. Sinusoids were absent. No mitotic figures were seen outside of the reaction centers. Inflammatory lymphoid tissue was noted in eight cases. All patients underwent biopsy or excision of the lesion. (Fig. 2.)

Twelve of twenty-eight patients (43 per cent) were re-examined one to ten years after operation. No recurrences were found. Generalized lymphoid disease or lymphosarcoma had not developed in any patient. In those who underwent biopsy only the lesion was still present but had not changed its character or progressed. Biopsy only was employed in six patients (approximately 21 per cent of the total) who had the larger lesions or multiple lesions. Three of these patients were followed up for ten, seven and two years, respectively, with no change noted in the rectal lesion. Twenty-two patients were treated with excision of the lesion or lesions. None of the eight patients in this group who had follow-up examinations had any evidence of recurrence of the tumor. The follow-up period in these eight cases varied from one to seven years.

OLEOMAS

The second most common lesion found in this series was the oleoma. Such lesions occurred in twenty cases (22 per cent of the entire series). The lesions were encountered most commonly in patients who were in the fifth decade of life, although approximately one-fourth were seen in patients who were less than forty years of age. The youngest patient was twenty-nine years of age. The average lesion measured 1.5 cm. in diameter and multiple lesions were found in 20 per cent of the cases. Grossly, no characteristics identified these lesions or distinguished them from other submucosal nodules. Fifty per cent occurred on the anterior wall, but this probably is due to the accessibility of the anterior internal hemorrhoidal region for injection therapy. Another factor may be that it is easier to visualize the anterior wall on sigmoidoscopic examination.

Nine patients (45 per cent) gave a history of receiving injection therapy for internal hemorrhoids. Three other patients had undergone rectal surgery for hemorrhoids prior to being seen at the clinic. It is possible that they had injection treatment at that time and were unaware of it. The interval between injection and discovery of the nodules varied from six months to six years. It has previously been shown that oleomas are the result of injections of an insoluble oil. It was not possible in this series to determine what types of oil were used at the time of injection therapy.

All nodules occurred within 6 cm. of the dentate margin. Grossly, they were firm and covered with mucosa. No characteristic color was noted. In one case a multinodular stricture was present in the lower part of the rectum. This was the only case in the series in which the symptoms bore a direct relationship to the presence of the oleoma. (Fig. 3.)

Four oleomas yielded fluid when incised. One of the four patients had had eight injections for hemorrhoids one year prior to removal of the oleoma which exuded 2 to 3 cc. of pus and contained an abscess cavity. Another pa-

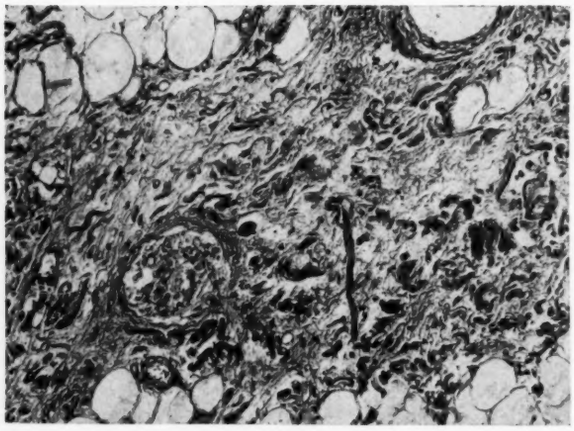


FIG. 3. Mounted section of an oleoma. Note cystic cavity in upper right-hand corner. Hematoxylin and eosin, original magnification × 110.

FIG. 4. A submucosal rectal carcinoid as seen after local excision. Note small size of the lesion.

tient had had injections for hemorrhoids six months before removal of the oleoma which contained necrotic material. The third patient had no history of injection treatment and the lesion contained thick brownish material. The fourth patient had had injection treatment at some previous time but the exact date could not be ascertained; the nodule in this case contained thick yellow fluid.

CARCINOIDS

The carcinoids in our series occurred equally in both sexes, eight in women and eight in men. The average age of the sixteen patients was forty-five years; the youngest was twenty-six years of age and the oldest was sixty-seven. Six carcinoids (37.5 per cent of this group) occurred in patients less than forty years of age.

Proctoscopic findings in this group yielded the following information: The average size was less than 1 cm. in diameter; the smallest carcinoid was 3 mm. and the largest was 1.5 cm. in diameter. All carcinoids occurred within 9 cm. of the dentate margin. One patient gave a history of injection therapy and the lesion was suspected of being an oleoma.

Grossly, all lesions were elevated, small, hard, pea-sized nodules which were usually spherical. Color of the *in situ* lesion varied from yellow to white. The majority were not characteristically yellow; but when the lesion appeared yellow-tinged, it was usually a carcinoid. (Fig. 4.)

Microscopically, the mucosa was intact in all lesions of this group except one which previously had been biopsied and treated with radium.

In four cases carcinoid tumor had invaded the mucosa but had not ulcerated the surface epithelium. Cells in the submucosal lesions were arranged in cords and strands, and presented the typical picture of a carcinoid. (Fig. 5.)

In nine cases treatment consisted of excision alone; in five, excision and fulguration; in one, radium followed with resection; and in one, abdominoperineal resection.

Only one patient has not been seen since the initial operation. Twelve patients (75 per cent) have been seen and examined during the ensuing one to five years. All patients were sent letters of inquiry in 1955 and eight replied. There were no recurrences or evidence of rectal disturbance in the group. The longest follow-up has been seven years, the average approximately five years.

INFLAMMATORY LESIONS

The lesions of all eleven patients in this group were non-specific in origin and no etiologic agent was obvious except that in one case radium had been employed for an extrarectal lesion prior to discovery of the rectal nodule. There were seven men and four women in this group. The average age was 47.4 years; the youngest patient was thirty-seven years of age and the oldest was seventy-two.

On proctologic examinations all of the inflammatory lesions were found within 6 cm. of the dentate margin. In three cases (27 per cent) multiple lesions were present and in three the lesions were cystic. The average size was approximately 1 cm. Four of the patients gave

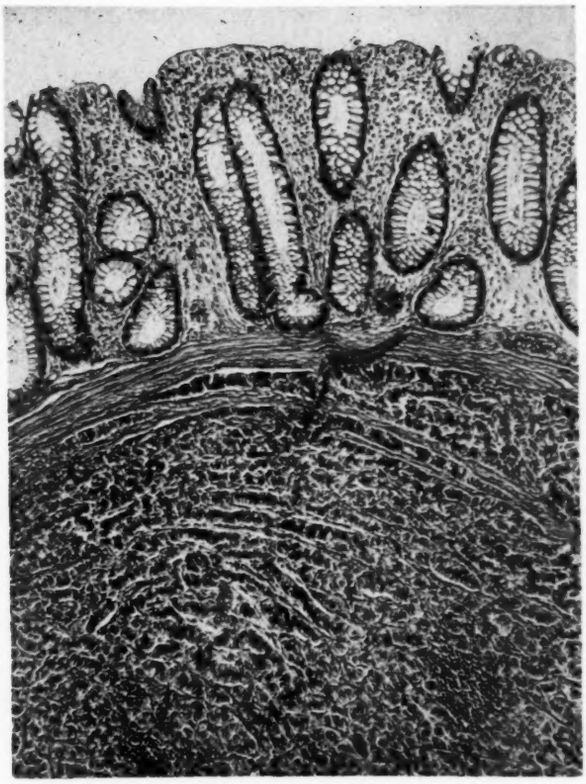


FIG. 5. Microscopic section of submucosal carcinoid of the rectum showing prismatic cells in their characteristic ribbon-like arrangement. Hematoxylin and eosin, × 60.

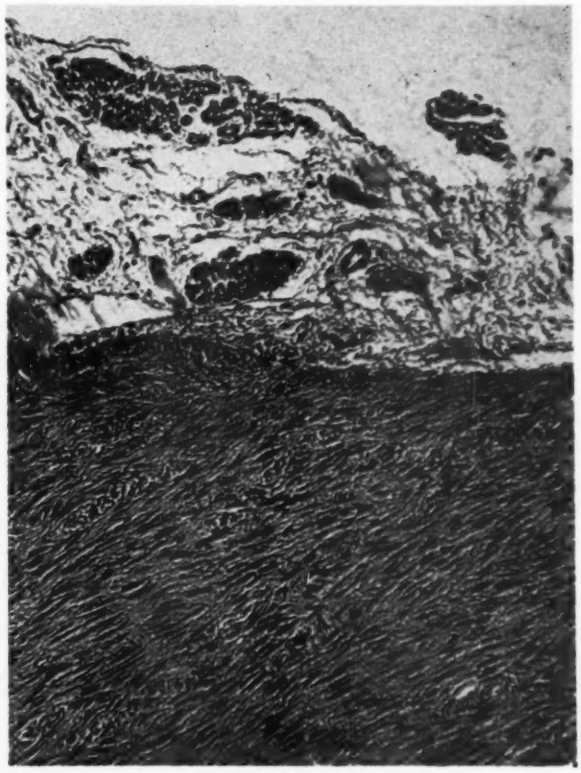


FIG. 6. Submucosal leiomyoma of the rectum. Note plump, cigar-shaped smooth muscle arranged in interlacing bundles. Hematoxylin and eosin, × 160.

a history of previous injection therapy. It is possible that only mucosa was obtained for biopsy of some of these lesions and they were actually oleomas. As with the other lesions, these lesions were found most commonly (in 45 per cent of cases) on the anterior rectal wall.

Pathologic examination of these lesions revealed acute or chronic inflammatory changes in the rectal mucosa. Some contained areas of fibrosis and others had either yellow or amorphous-appearing material in the mucosa and submucosa. Treatment of this group consisted of excision of the nodule.

LEIOMYOMAS

In this group of five patients four were men and one was a woman. The ages varied from thirty-four to sixty-eight years; the average age was 53.5 years.

All of the leiomyomas were situated within 3 cm. of the dentate margin. The average size was 1.5 cm. in diameter. Two lesions were located on the anterior wall and two were found on the left wall of the rectum. The site of the fifth lesion was not stated.

No symptoms were referable to the lesion. Three of the lesions were found on general physical examination; the other two patients had complained of bleeding and rectal discomfort.

All lesions were excised with the patients under sacral or caudal anesthesia. All were typical leiomyomas. (Fig. 6.) Each showed intact mucosa overlying characteristic interlacing bands of smooth muscle bundles surrounded by a capsule. No mitotic figures were seen in any of the lesions. None of the patients in this group returned for re-examination.

MISCELLANEOUS LESIONS

Only one submucosal rectal lesion proved to be a leiomyosarcoma. The patient was a sixty-three year old white man. The lesion measured 2 by 2.5 cm. and was situated on the left rectal wall 2 cm. above the dentate margin. It was described as movable with normal mucosa overlying the tumor. There was no

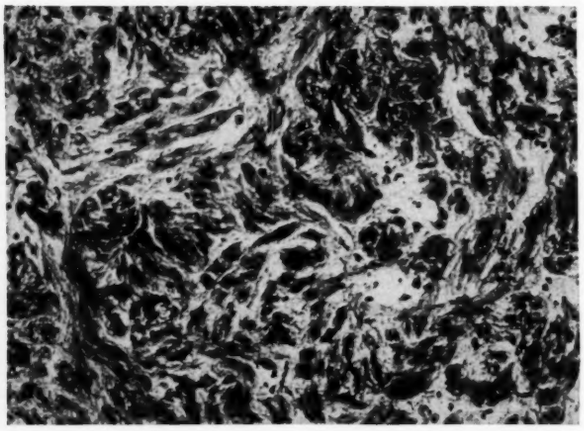


FIG. 7. Leiomyosarcoma, grade II. Increase in cellularity and mitotic figures distinguish this from its benign counterpart. Hematoxylin and eosin, original magnification × 200.

ulceration of the mucosa. Treatment consisted of wide excision with fulguration of the base. Microscopically, typical pathologic mitotic figures were seen. (Fig. 7.) Three months later the patient died of coronary occlusion. Necropsy was not performed.

One adenocarcinoma, grade I, was found in a submucosal rectal nodule in a case in which multiple carcinomatous lesions were found in the colon. The adenocarcinomatous rectal lesion probably represented a metastatic lesion as a result of sedimentation from a lesion higher in the colon.

One lipoma of the rectum was found in a sixty-two year old white man. The lesion, which was 8 mm. in diameter, was situated just above the dentate margin on the anterior rectal wall. The treatment was excision.

Two phleboliths are included in this series. Both occurred in women, and both were treated with excision. Both were palpable hard nodules. The lesions measured 3 mm. and 1 cm., respectively, in diameter. One was situated 5 cm. above the dentate margin; the site of the other was not stated.

Four other cystic lesions were encountered. These lesions measured 1.5 by 2 cm., 3 by 5 cm., and 1.8 cm. and 0.5 cm. in diameter. All were found within 5 cm. of the dentate margin. One was on the posterior rectal wall, the remainder on the anterior wall. The contents of one of the cystic lesions were described as dark brownish material; the second lesion contained yellowish material. The type of contents of the remaining two lesions was not stated. Two of the lesions were excised and the other two were incised and drained.

Two foreign body granulomas presented as submucosal rectal nodules. Both occurred in women, aged forty-five and fifty-five years, respectively. Both lesions were found on the anterior rectal wall. The exact location of one was not available; the other was situated just above the dentate margin. One lesion measured 8 by 5 mm.; the size of the other was not recorded.

On microscopic examination the granulomas showed hypertrophic submucosal lymphoid nodules with granulomatous and foreign body giant cell reaction. One contained small amorphous foreign particles, some of which appeared calcareous. Symptoms were not related to the lesion. No generalized disease was noted in either case. Follow-up by letter revealed no development of new lesions or generalized disease four and six years after excision of the original lesion.

COMMENT

In commenting on these data we will emphasize treatment particularly.

Submucosal nodules of the rectum are not uncommon. Most of them are situated on the anterior rectal wall; this may be more apparent than real because the anterior wall is more thoroughly examinable during proctoscopic examination. We evaluated only those cases in which surgical treatment was performed at the Mayo Clinic from 1945 through 1951. During the same period several other cases were seen with nodules in the submucosa of the rectum but excision or biopsy was not performed. The reason for this probably is twofold: The patient wished to undergo operation elsewhere or the investigator considered the lesion insignificant and of no immediate danger to the patient. The definite indications for surgical treatment in the cases studied were not discernible; however, the lesions must have aroused the suspicion of the examining physician and excision or biopsy was carried out, perhaps to rule out any possibility of malignancy.

Malignant Lesions. Eighteen (19.9 per cent) of the submucosal rectal nodules in this series proved to be malignant, of which sixteen (17.5 per cent of the entire series) were carcinoids. Of interest is the fact that six (37.9 per cent) of the carcinoid tumors occurred in patients less than forty years of age. None of

the lesions showed ulceration of the mucosa except the one which had been previously biopsied and then treated with radium. No multiple carcinoids were seen in this series but they have been seen at the clinic and have been reported by others. An average follow-up of five years after local excision with fulguration of the base or simple local excision disclosed no recurrence in our cases. Five years is a somewhat short follow-up for slowly progressing carcinoids; a longer follow-up would lead us closer to the correct mode of therapy.

The carcinoid of 1.5 cm. in diameter reported by Kunkel, Dockerty and Waugh which showed a metastatic lymph node certainly would make one wary of any local procedure. However, one patient in this series with a lesion of similar size was treated with local excision and a two-year follow-up has shown no evidence of recurrence. Again, the time element in this case is still too short to allow any conclusions to be drawn about the effectiveness of this treatment.

No attempt was made to reverify the fact that rectal carcinoids do not always reduce silver salts. It is believed that many of the nonconformists to the silver staining are not in fact carcinoids but are ordinary carcinomas with a carcinoid appearance (small cell).

Adenocarcinoma in a submucosal rectal nodule is rare. However, the fact that one was found supports our belief that biopsy specimens should be taken from all submucosal nodules.

The leiomyosarcoma was a 2.5 by 2 cm. lesion which was approximately 1 cm. larger than the average leiomyoma of this series. No proof was found that this malignant lesion developed from a benign leiomyoma. Because of Neuman's report it is probably best to excise benign leiomyomas. This was done in our series but no follow-up was obtainable. The one leiomyosarcoma was excised widely but unfortunately the patient died from other causes in less than six months. It is believed that radical treatment should be the treatment of choice for leiomyosarcoma of the rectum if the condition of the patient will warrant it. Even at best the prognosis for these patients is very poor.

Benign Lesions. The leiomyomas in the series were firm nodules averaging 1 to 2 cm. in diameter, situated in the distal 3 cm. of the rectum. Grossly, they could not be differentiated from other submucosal nodules.

The etiology of the lymphoid hyperplasia is still undetermined; however, our series yielded no evidence that hypertrophied lymphoid tissue developed into lymphosarcoma and no generalized lymphoid disease has developed in any of these cases. The pathologic diagnosis of giant follicular hyperplasia did not seem to have any direct relationship to prognosis. No gross characteristics were found which differentiated this lesion from other submucosal nodules. There were no symptoms which were directly related to any of the lymphoid tumors in this group.

Biopsy of oleomas to identify the tissue and rule out malignancy appears to be adequate treatment as these lesions do not tend to expand after the initial tissue reaction.

As stated before, the inflammatory lesions encountered were non-specific in origin except in one patient whose reaction was believed due to radium therapy. Four of the patients who showed submucosal inflammation gave a history of previous injection therapy. It is possible that the biopsy was inadequate and that the inflammatory lesions were in reality oleomas.

The four cysts were soft, freely movable submucosal lesions. They were adequately treated with local excision or incision and curettement. The two phleboliths were hard, pea-sized nodules which felt very similar to the carcinoids. These lesions are palpable but very difficult to see. All carcinoids in this series were elevated nodules and could easily be seen on proctoscopic examination. Phleboliths should be biopsied to rule out the possibility of a carcinoid tumor.

Lipomas are usually soft and appear like a small polyp. Biopsy reveals fatty tissue and illustrates the true nature of the lesion.

SUMMARY AND CONCLUSIONS

Ninety-one submucosal rectal nodules removed at the Mayo Clinic from 1945 through 1951 were studied pathologically; the cases were reviewed and follow-up data noted so that some opinion could be formulated about treatment.

Nineteen and seven-tenths per cent of the submucosal rectal nodules were malignant. These consisted of sixteen carcinoids, one adenocarcinoma and one leiomyosarcoma.

From this small series it appears that submucosal carcinoids less than 1 cm. in diameter can be adequately treated with local excision

and fulguration of the base. Larger growths of this type perhaps should be treated with more radical operations. A carcinoid can usually be identified as a yellow-tinged, pea-sized, elevated submucosal nodule; however, there is no *absolute* characteristic by which they can be identified grossly.

Leiomyomas probably give rise to leiomyosarcomas if left *in situ* long enough. It is therefore advocated that the benign leiomyomas be excised and the malignant ones treated with radical operation. No definite criteria were devised to distinguish the various submucosal nodules *in situ*. Biopsy at least should be carried out for all submucosal nodules, therefore, to differentiate the benign lesions from the malignant processes. The large majority (80.3 per cent in this series) of submucosal rectal nodules were benign and self-limiting.

REFERENCES

1. Anderson, P. A., Dockerty, M. B. and Buie, L. A. Myomatous tumors of the rectum (leiomyomas and myosarcomas). *Surgery*, 28: 642–650, 1950.
2. Ball, C. B. The benign neoplasms of the rectum. *Brit. M. J.*, 2: 1353–1355, 1890.
3. Buchanan, F. T., Smith, A. M. and Alrich, E. M. Carcinoid tumors of the rectum: report of four cases. *Surgery*, 33: 909–914, 1953.
4. Dick, W. Lymphadenoide Rektumpolypen. *Beitr. z. klin. Chir.*, 156: 263–274, 1932.
5. Dukes, C. Lymphoma of the rectum: with report of three cases. *Proc. Roy. Soc. Med.*, 27: 926–927, 1934.
6. Epstein, A. A. Über Lymphadenome des Rectum. *Arch. klin. Chir.*, 175: 351–356, 1933.
7. Erspamer, V. Caratteristiche delle cellule enterocromaffini tipiche e delle cellule preenterocromaffini argentofile. *Anat. Anz.*, 86: 379–388, 1938.
8. Goldman, M. L. and Marbury, W. B. Sarcoma of the rectum. *Am. J. Surg.*, 71: 387–391, 1946.
9. Greig, D. M. Lymphoma of the rectum. *J. Path. & Bact.*, 13: 49–50, 1909.
10. Hartmann, H., Bertrand-Fontaine, T. and Guérin, P. Les myomes du rectum. *J. chir.*, 42: 1–7, 1933.
11. Helwig, E. B. and Hansen, J. Lymphoid polyps (benign lymphoma) and malignant lymphoma of the rectum and anus. *Surg., Gynec. & Obst.*, 92: 233–243, 1951.
12. Hunt, V. C. Myoma of the rectum: report of four cases. *Ann. Surg.*, 74: 236–244, 1921.
13. Jackman, R. J. Submucosal nodules of the rectum: diagnostic significance. *Proc. Staff Meet., Mayo Clin.*, 22: 502–504, 1947.
14. Jackman, R. J. and Buie, L. A. Submucosal nodules of the rectum. *S. Clin. North America*, 24: 903–909, 1944.
15. Jacob, O. and Fauré-Fremiet. Tumeurs consécutives à l'injection d'huile camphrée préparée avec de l'huile de vaseline (vaselinomes). *Rev. de chir.*, 54: 221–263, 1917.
16. Knoflach, J. G. Ein Beitrag zur Pathologie und Chirurgie der Mastdarmpolypen. *Wien. klin. Wchnschr.*, 40: 876–877, 1927.
17. Konjetzny, G. E. Lymphadenoide Polypen des Rektum: Bemerkung zu dem Aufsatz von Siemens. *Zentralbl. Chir.*, 58: 3154, 1931.
18. Kunkel, W. M., Jr., Waugh, J. M. and Dockerty, M. B. Carcinoid of the rectum with metastasis: report of a case. *Ann. Surg.*, 139: 224–229, 1954.
19. Lehmann, H. Unter dem Bilde der "Polyposis" in Erscheinung tretende, umschriebene Hyperplasie des lymphatischen Gewebes im Dickdarm. *Deutsche Ztschr. f. Chir.*, 190: 391–396, 1925.
20. Li, I. Y. Benign lymphoma of the rectum. *Surgery*, 23: 814–820, 1948.
21. Malassez, L. Discussion. *Bull. Soc. anat. de Paris*, 47: 498, 1872.
22. Neuman, Z. Leiomyosarcoma of the rectum developing from benign leiomyoma. *Ann. Surg.*, 135: 426–430, 1952.
23. Popoff, N. W. Epithelial functional rejuvenation observed in the mucous cells of the gastrointestinal tract and the parietal cells of the stomach. *Arch. Path.*, 27: 841–887, 1939.
24. Rankin, F. W. and Larson, L. M. Myosarcoma of the rectum. *Minnesota Med.*, 15: 833–835, 1932.
25. Rosser, C. and Wallace, S. A. Tumor formation: pathologic changes consequent to injection of oils under rectal mucosa. *J. A. M. A.*, 99: 2167–2170, 1932.
26. Siemens, W. Lymphadenoider Polyp des Rektums. *Zentralbl. Chir.*, 58: 2070–2072, 1931.
27. Stout, A. P. Carcinoid tumors of the rectum derived from Erspamer's pre-enterochrome cells. *Am. J. Path.*, 18: 993–1004, 1952.
28. Vander Espt. Cited by Hunt, V. C.[12]
29. Weeks, J. H. Sarcoma of the rectum: report of case with review of the literature. *Surg., Gynec. & Obst.*, 44: 478–482, 1927.
30. Weidman, F. D. The danger of liquid petrolatum in parenteral injections. *J. A. M. A.*, 80: 1761–1763, 1923.

DISCUSSION

Paul M. Vickers (Oklahoma City, Okla.): Physicians generally are recognizing the significance of submucosal rectal nodules. Of the cases I have seen in the past ten years, approximately 85 per cent were diagnosed by the patients' local physicians. The experience of the examiner seems to be in direct proportion to the discovery of these lesions. In the rectal clinic of our University Hospital, where the residents make the sigmoidoscopic examinations, less than one-half of the submucosal nodules were found compared to an equal number of private patients examined. The types of lesions are essentially the same everywhere. However, as Dr. Jackman has stated, the incidence of oleomas

is decreasing. All of the oil granulomas I have seen have been multinodular, which facilitates the presumptive diagnosis.

Dr. Swartzlander states that local excision is apparently adequate for these lesions, even carcinoids, of 1 cm. in diameter or less. My experience has been similar. In two patients second local excisions were thought to be indicated. One patient had had a submucosal lymphoid tumor excised elsewhere in 1952. His local physician discovered a recurrence in February, 1955. A submucosal lymphoid tumor 1 cm. in diameter proximal to the left dentate margin was excised. Subsequent examinations have shown no recurrence. The second patient had a carcinoid 8 mm. in diameter in the anterior rectal wall. She had extensive anorectal scarring from multiple operations and injection treatments in 1938. The first biopsy specimen was considered inadequate so a second local excision was performed in January, 1955. Follow-ups have revealed no abnormalities.

Follow-up examinations have been stressed by Dr. Swartzlander. The following case illustrates their importance. In 1948 at the Mayo Clinic a patient was told to have periodic examinations because of an anterior rectal nodule. He gave a history of having had injection treatments. He came to me in 1949 and 1950 but not again until 1953 when a grade II adenocarcinoma of the anterior rectal wall had developed. This was resected by an abdominoperineal procedure, and microscopic sections revealed no lymph node involvement. The causal relation is problematic.

Dr. Swartzlander has re-emphasized the necessity for biopsy of all rectal submucosal nodules and has helped to clarify the definitive treatment.

FRANK C. SWARTZLANDER (closing): Our series was small, and I am sure that our follow-up of carcinoid tumors has been too short. However, it does appear that local excision is adequate treatment for lesions 1 cm. or less in diameter. It is hoped that in the next five years we will continue follow-up of these cases; with a ten-year follow-up we will have a more accurate idea of the best mode of treatment for small carcinoid tumors of the rectum.

Simultaneous Anterior and Posterior Pilonidal Cyst

M. D. REDDING, M.D., *San Diego, California*

THE usual site of a pilonidal cyst is in the sacrococcygeal region. Much thought has been devoted toward determining the etiology of and devising the best treatment for this common condition. The most popular theory of origin has been based upon the concept of a congenital defect wherein the cyst is a remnant of the neural canal[1] or represents a local invagination of the skin.[2] A recent review of the literature and discussion by Hopping[3] adds nothing new to confirm or refute this concept.

Perversely, however, reports of pilonidal cysts in locations that are unlikely sites for congenital defects occur in the literature. These locations are the axilla,[4] the interdigital webs of barbers[5] and the perineum, anterior to the anus.[6] These reports suggest that there may be another cause for pilonidal cyst and sinus, the simple re-entry of hair into the skin in favorable locations. Davage, in 1954,[7] analyzed 463 cases of pilonidal cyst. His histopathologic study led to his rejection of the congenital theory in favor of the acquired theory. The same year, Gifford[8] emphasized the role of hair in the pathogenesis of postanal pilonidal sinus, stating that the picture of inflammation, the presence of broken hair shafts and the paucity of hair follicles pointed to the mechanical re-entry of hair into the skin as the cause of postanal pilonidal cyst. This view was stimulated by observations of the pathogenesis of pilonidal cysts developing in the interdigital webs of barbers. Joseph and Gifford[5] examined 115 barbers. Of these, fifteen had lesions in the interdigital webs. The structure of the lesion is variable. There may be an epithelium-lined tract, a cyst or simple dimpling with or without penetration of the epidermis by the short cut hairs. When the epidermis is penetrated completely, the hairs may remain free with a surrounding foreign body reaction. Superimposed acute or chronic inflammatory reaction may be present.

Smith, in 1948, was the first to describe anterior or perineal pilonidal cysts.[6] He presented four cases, all of which were men. All cysts contained hair and had their external openings to one side of the midline. No communication with the anus was found in the sinus by preoperative injection of radiopaque oil or at surgical excision. The microscopic picture revealed the same structure as that found in coccygeal pilonidal cyst. One patient had two pilonidal cysts, a conventional coccygeal and an anterior or perineal pilonidal cyst. A perusal of the literature subsequent to 1948 discloses no other report of anterior pilonidal cyst.

Therefore, it may be of interest to report one additional case of pilonidal cyst in this unusual location with a coincident postanal pilonidal cyst. The perineal cyst was diagnosed as a probable fistula prior to surgical excision.

CASE REPORT

A thirty-one year old white man presented himself for examination with the chief complaint of drainage from a sinus in the anterior perianal region. He also complained of anal protrusion and bleeding, and occasional attacks of painful swelling in the coccygeal region. Sigmoidoscopy was performed and the bowel was found to be normal for 20 cm. A moderate amount of internal and external hemorrhoidal tissue was present. The left anterior perianal region presented a draining sinus which could be probed from its external opening near the anal verge distally into the perineum for 5 to 6 cm. A diagnosis of anal fistula was tentatively made although no communication with the anus itself could be found upon close inspection. A quiescent pilonidal cyst and sinus were noted in the conventional sacrococcygeal region.

Under low spinal anesthesia the quiescent pilonidal cyst in the sacrococcygeal region was probed and the tract found to be 4 cm. in extent. This was excised by the marsupialization technic and hemorrhoidectomy was performed. Finally, attention was directed to the supposed fistula. A probe was passed into the draining sinus in the left anterior perianal quadrant and found to extend into the perineal region for 5 to 6 cm. The tissues overlying were incised and débrided. The sinus tract con-

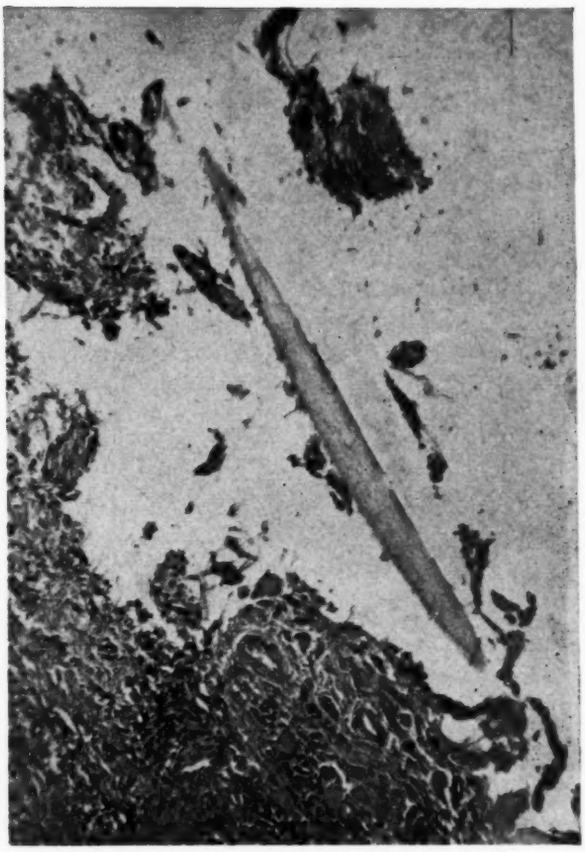


FIG. 1. Broken hair shaft from anterior pilonidal cyst.

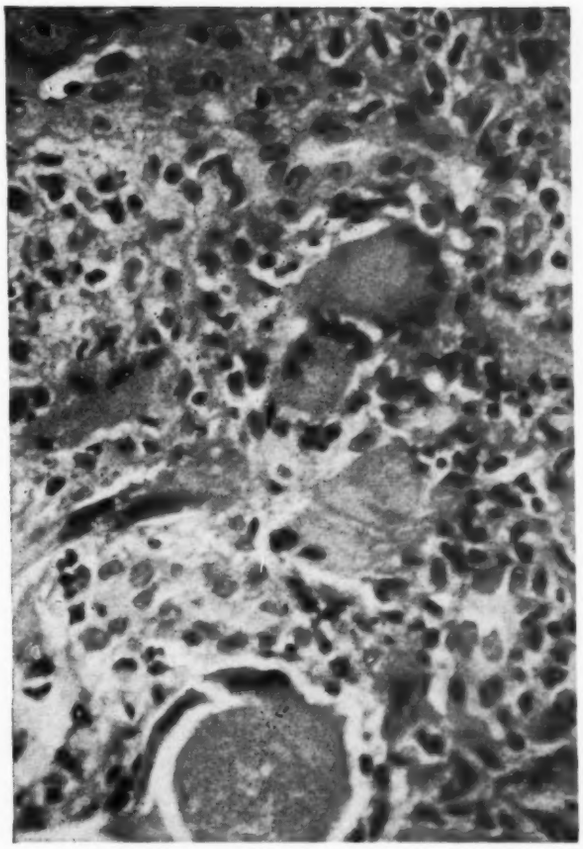


FIG. 2. Foreign body giant cell from anterior pilonidal cyst.

tained the typical gelatinous necrotic material seen in pilonidal cyst with numerous hair shafts and small curls of hair embedded in the necrotic substance. An inspissated fecalith approximately 1 cm. in diameter was also noted in the sinus tract. There was no communication between the tract and the anus. The most proximal part of the sinus was well outside the anal canal. The tract was curetted and débrided and allowed to heal by secondary intention.

Microscopic report of the anterior sinus described a chronic inflammatory tract with fragments of hair shafts (Fig. 1) in the granulation tissue and foreign body giant cells (Fig. 2) compatible with the diagnosis of pilonidal cyst.

COMMENTS

The presence of a pilonidal cyst and sinus other than in the conventional coccygeal location indicates that the mechanical re-entry of hair into the skin is responsible for some types of pilonidal cyst. It is probably premature to discard the theory of a congenital defect for postanal pilonidal cyst and sinus, but this and similar reports will provide support for the theory of re-entry. The exact role of the congenital defect, whether it is the primary cause or simply the portal of penetration for hair shafts, must await clarification.

REFERENCES

1. MALLORY, F. B. Sacrococcygeal dimples, sinuses and cysts. *Am. J. M. Sc.*, 103: 263, 1892. Quoted by Gifford, H.[8]
2. STONE, H. B. Pilonidal sinus (coccygeal fistula). *Ann. Surg.*, 79: 410, 1924. Quoted by Gifford, H.[8]
3. HOPPING, R. A. Pilonidal disease: review of the literature with comments on the etiology, differential diagnosis and treatment of the disease. *Tr. Am. Proct. Soc.*, pp. 780–788, 1954.
4. AIRD, I. Pilonidal sinus of axilla. *Brit. M. J.*, 1: 1952. Quoted by Gifford, H.[8]
5. JOSEPH, H. L. and GIFFORD, H. Barbers interdigital pilonidal sinus. *Arch. Dermat. & Syph.*, 70: 616–623, 1954.
6. SMITH, T. E. Anterior or perineal pilonidal cysts. *J. A. M. A.*, 136: 973–975, 1953.
7. DAVAGE, O. N. The origin of sacrococcygeal pilonidal sinuses based on an analysis of four hundred sixty-three cases. *Am. J. Path.*, 30: 1191–1204, 1954.
8. GIFFORD, H. The role of hair in the pathogenesis of postanal pilonidal sinus. *Stanford M. Bull.*, 12: 185–189, 1954.

Observations on the Problem of Perianal Infection in Chronic Ulcerative Colitis

URBAN R. FINNERTY, M.D., *Montclair, New Jersey*

THE association of chronic ulcerative colitis and perianal infection is not too well recognized by the profession in general and its pathogenesis is not well understood, despite excellent papers on this problem during the past several years. A review of the literature indicates that the percentage of perianal infection in chronic ulcerative colitis varies from 8.4 per cent as reported by Smith, Jackman and Mayo,[5] to 17.5 per cent as reported by Granet.[13] More recently Neuman, Bargen and Judd,[9] in a review of 201 cases of regional colitis, reported an incidence of perianal and perirectal suppurative manifestations in 22.3 per cent.

The development of perianal infection in chronic ulcerative colitis is most easily explained on the basis of invasion of the perianal space through the crypts of Morgagni by the infected contents of the bowel. However, I do not believe that this is the entire picture. It seems likely to me that gravitation of infected material into the rectal reservoir permits subsequent invasion of the lymphatics of the perineum by bacteria or possibly by a cellulolytic enzyme producing a necrotizing inflammatory reaction in the cells.

During the past three years I have observed eighteen such cases, several of which are summarized as follows.

CASE REPORTS

CASE I. Miss K. (Case B-8057), a twenty year old woman, had severe protracted diarrhea at the age of sixteen. She was first operated upon in August, 1952, for an ischiorectal abscess. The wound healed poorly; revision of the wound for better drainage was done in October, 1952. Examination on January 8, 1953, revealed a large unhealed abscess wound associated with an unhealed fissure in the posterior commissure and two posterior wounds connected by a subcutaneous tract but with no definite primary opening. While sigmoidoscopy did not reveal the picture of chronic ulcerative colitis, this diagnosis was considered as the underlying disorder at the time. Definitive anorectal surgery was performed in March, 1953, followed by a very protracted period of healing, lasting more than seven months, despite medication which included every known antibiotic (cortisone, ACTH) and every conceivable type of local treatment. At present healing is complete, but endoscopic examination reveals superficial ulceration of the rectal mucosa overlying the rectovaginal septum which may be indicative of further trouble.

CASE II. Mrs. M. (Case 1835) had undergone hemorrhoidectomy for bleeding hemorrhoids in 1943. Operation was performed again for hemorrhoids in 1944. She was admitted to the hospital in September, 1945, with an ischiorectal abscess and fistula; fistulectomy was performed and she was discharged on October 16, 1945. She was readmitted on March 31, 1948, for repair of a rectovaginal fistula which was not successful. The patient was discharged on April 24, 1948, with persistent purulent drainage from the rectovaginal wound. She was readmitted on February 21, 1949, for repair of the rectovaginal fistula and prolapse of the anal canal which was done on March 14th. The wounds still failed to heal and she was discharged on April 5th unimproved. She was readmitted on April 10th with severe pain and swelling in the perineum; this was treated by incision and drainage. She was readmitted in June, 1949, with symptoms of fecal drainage from the perineum; transverse colostomy was performed on July 27th and she was discharged on October 29th. On November 7, 1949, she was admitted for another plastic repair of the perineum which was done November 24th. Finally in February, 1952, the diagnosis of chronic ulcerative colitis was made and colectomy was performed. At present the patient is in a relatively good state of health.

CASE III. Mrs. B. W., a nineteen year old woman, had had colitis since the age of nine. At

fourteen sympathectomy was performed which was followed by very gradual improvement over the next two years, permitting her to finish school and become employed. Three years previously a perianal abscess had developed, ruptured spontaneously and had drained since. Despite this history she was operated upon in February, 1954, for hemorrhoids and fistula. The result was an anorectal stricture and a rectovaginal labial fistula.

CASE IV. Mrs. E. M., a 49 year old woman, gave a history of colitis beginning in 1950 and manifested by abdominal cramps and eight to ten loose stools a day intermittently for a period of six months associated with rectal bleeding. She consulted a physician for treatment; the abdominal cramps and frequent loose stools subsided but the bleeding persisted and was considered to be hemorrhoidal in origin. Hemorrhoidectomy was performed in May, 1951, but bleeding and a mucoid discharge from the anus persisted. Examination early in 1952 revealed a marked anal stenosis with an anterior, low level anal fistula. Examination with a ½ inch endoscope showed purulent exudate in the rectal ampulla with a granular inflammation of the rectal and sigmoidal mucosa. On a regimen of zinc peroxide retention enemas daily and 8 gm. of sulfathalidine® orally daily for one week each month, the patient has had no further bleeding or discharge and has been entirely well for more than two years.

CASE V. R. A., a forty-six year old man, had been operated upon twenty years previously for ischiorectal abscess and fistula. Since then he had had numerous recurrences of diarrhea and bleeding. He had no further evidence of perianal infection until July, 1953, when purulent drainage from the anterior perianal region was noted. Examination revealed a low level, anterior fistula with a small localized abscess associated with anal stenosis. Endoscopy revealed granular inflammation of the mucosa with increased vulnerability to trauma. On conservative measures comprising intermittent courses of sulfathalidine, azulfidine and tetracycline orally and zinc peroxide retention enemas, he has progressed very well. At present he has one or two bowel movements a day with no bleeding and the fistula, while still present, is quiescent.

CASE VI. Mrs. G. S. (Case 2302), a forty-nine year old woman, had known chronic ulcerative colitis of four years' duration. Elective hemorrhoidectomy was performed at a leading medical center in October, 1955. One month following surgery an extensive ischiorectal abscess and a rectovaginal labial fistula developed. The patient was operated upon during a so-called quiescent period, but surgery provoked a recurrence of diarrhea with subsequent perianal complications. The need to point out, even to those in university hospitals, the danger of performing elective anorectal surgery on patients with chronic ulcerative colitis is obvious.

CONCLUSIONS

A review of the eighteen cases studied lead to the following conclusions:

1. The most frequent symptom of bowel dysfunction in chronic ulcerative colitis, especially of the insidious type, is rectal bleeding.[15] This symptom is often erroneously believed to be hemorrhoidal in origin and hemorrhoidectomy is recommended for its cure.

2. More than 50 per cent of the patients studied during this period were operated upon for anorectal disorders without the underlying diagnosis being made; or if diagnosed, the seriousness of the underlying disorder was not properly evaluated.

3. Great risk is involved in performing anorectal surgery in patients with apparently quiescent conditions.

4. Good and sometimes excellent results may be obtained by conservative therapy. This was demonstrated in two patients, one of whom was treated over a period of twenty years.

SUMMARY

Observations made from a study of eighteen patients with perianal infection complicating chronic ulcerative colitis have indicated the need for pointing out again the pitfalls in the handling of this problem. In whatever manner these patients are treated, the tremendous problems that may be encountered should be appreciated. One should constantly be on guard to rule out colitis in patients with bleeding hemorrhoids, anal fissure, fistulas or other anorectal disorders. Certainly, when even the slightest suspicion of colitis exists, surgery is never justified without an adequate work-up which must include, among other procedures, careful proctosigmoidoscopy, x-ray studies of the colon and small intestine and even a determination of the activity of the pathologic process in the colon by a mucosal aspiration wet smear. This may be done by using a heavy bore capillary tube inserted through the sigmoidoscope. A purulent cystology in the mucosal exudate is indicative of active intramural infection and may doom to failure any anorectal procedure performed on a patient with an apparently quiescent condition.

REFERENCES

1. Ault, G. W. Surgical treatment of ulcerative colitis. *Arch. Surg.*, 58: 243–247, 1949.
2. Ault, G. W. The surgical treatment of chronic ulcerative colitis. *South. M. J.*, 41: 884–888, 1948.
3. Cattell, R. B. Surgical aspects of chronic ulcerative colitis. *Am. J. Surg.*, 86: 613–616, 1953.
4. Cattell, R. B. and Sachs, E., Jr. Surgical treatment of ulcerative colitis. *J. A. M. A.*, 13: 929–934, 1948.
5. Jackman, R. J. and Mayo, C. W. Chronic ulcerative colitis—anorectal complications. *Surg., Gynec. & Obst.*, 98: 478–480, 1954.
6. Vaughan, G. D. and Bacon, H. E. Surgical management of chronic ulcerative colitis. *South. M. J.*, 47: 460–464, 1954.
7. Smith, N. D. and Jackman, R. J. Anorectal complications of chronic ulcerative colitis, with several illustrative cases. *Surgery*, 7: 69, 1940.
8. Wilson, E. Anal fistula with extension to the thigh. *Brit. M. J.*, 1: 656, 1953.
9. Neuman, H. W. and Dockerty, M. B. Pathology of regional (segmental) colitis. *Surg., Gynec. & Obst.*, 99: 572–579, 1954.
10. Rowe, A. H. Personal communication.
11. Warren, S. and Sommers, S. C. Pathology of regional ileitis and colitis. *J. A. M. A.*, 154: 189–193, 1954.
12. Dukes, C. E. The surgical pathology of ulcerative colitis. *Ann. Roy. Coll. Surgeons, England*, 14: 389–400, 1954.
13. Granet, E. Manual of Proctology, pp. 217–218. Chicago, 1954. Year Book Publishers, Inc.
14. Rowe, A. H. and Rowe, A. H., Jr. Chronic ulcerative colitis and regional enteritis—their allergic aspects. *Ann. Allergy*, 12: 387–402, 1954.
15. Bargen, J. A. Personal communication.

DISCUSSION

Robert J. Rowe (Dallas Tex.): The importance of severe perianal or anorectal infections associated with chronic non-specific ulcerative colitis is attested to by the fact that, when severe, they are considered an indication for ileostomy and coloproctectomy.

As far as the pathogenesis of these infections is concerned, it seems perfectly logical that they occur as a result of excessive trauma from the passage of stools with a resultant cryptitis in the presence of an abundance of virulent organisms. In fact, it is interesting that the incidence is not higher. Twenty-five per cent of our patients have had anorectal complications. Anorectal infections also occur frequently in patients with regional enteritis and, clinically, are similar to those associated with ulcerative colitis.

I would like to emphasize Dr. Finnerty's point that it is extremely important to be constantly on the alert for the presence of colitis in patients whose chief complaint is bleeding. Diarrhea is not always present. It is an enlightening experience to see flagrant ulcerative proctitis in a patient who has just given a history of constipation. It is also most humiliating to operate on patients with ulcerative colitis that has been unrecognized preoperatively, although in my opinion this is sometimes unavoidable. In any patient with unusual or extensive perianal infection the possibility of ulcerative colitis should be suspected. This is also true in those patients in whom no cause for delayed postoperative healing can be ascertained. Dr. Finnerty has inferred that the preoperative preparation of every patient should include a barium enema and a study of the small bowel. It is not possible for all of our patients to have these procedures done preoperatively. The best method of diagnosis is a careful sigmoidoscopic examination. Often, the barium enema may give a negative result in the presence of early or minimal ulcerative colitis. I have had no experience with cytologic studies of wet smears and I would like to have Dr. Finnerty comment in more detail regarding this examination.

The devastating anorectal complications of ulcerative colitis were demonstrated in two of my patients. In one, a twenty-six year old white woman, multiple abscesses and fistulas developed in a severe third degree perineal laceration which was incurred at childbirth concomitantly with the death of the baby. There had been no previous history of ulcerative colitis, either prior to childbirth or six months later when I first saw this patient. Six weeks later the extensive supralevator, perineal and ischiorectal abscesses were drained with destruction of at least one-third to one-fourth of the sphincter anteriorly. There was still no definite evidence of ulcerative colitis and sigmoidal colostomy was performed in preparation for eventual perineal repair. Soon afterward bleeding occurred from the proximal colostomy loop and sigmoidoscopy as well as barium enema studies revealed involvement of the proximal bowel especially the right and transverse colon. Later, this patient was subjected to ileostomy, total colectomy and combined abdominoperineal resection.

Another patient was seen in consultation regarding closure of a rectovaginal fistula which had developed following hemorrhoidectomy five years previously. Two previous attempts at closure had been unsuccessful. The possibility of ulcerative colitis was considered immediately, but rejected since the rectal mucous membrane appeared normal except in the vicinity of the fistula. A Frei test gave a negative result. Proximal colostomy was recommended prior to any further attempt at closing the rectovaginal fistula. The colostomy was performed in another city and six months later the fistula was again repaired. Following the closure, extensive supralevator and ischiorectal abscesses developed and at this time the patient was again referred to me for treatment. Extensive

incisions were necessary for drainage. After adequate drainage, healing occurred but the fistula was still present. At this time it became obvious that the rectal mucous membrane definitely was involved by ulcerative colitis. The disease has remained mildly active but is confined to the rectum with no subsequent systemic or local complications.

Several pertinent points should be mentioned in regard to the treatment of these complications. I do not agree with the statement that great risk is involved in performing anorectal surgery on patients in apparently quiescent stages. There undoubtedly is some danger but this must be accepted in certain patients in an attempt to prevent more severe complications. I have operated on several patients in the quiescent stage with subsequent uneventful healing. I do concur with Dr. Finnerty that excellent results are obtained in some patients with conservative measures. For example, in one of our patients a small rectovaginal fistula had developed in a deep anterior ulceration of the lower rectum. This healed spontaneously following conservative management. Later, in this same patient an incomplete fistula developed which was excised together with several crypts and skin tags with uneventful healing. In this and other patients with anorectal infections complicating ulcerative colitis, rectal installations of nisulfazole apparently have been very beneficial.

URBAN R. FINNERTY (closing): One point that I made apparently was not clear, and that was the suggestion of performing barium enema and small intestinal studies in all patients to be operated upon. It would not be practical to perform such procedures on all patients, and I certainly do not do it myself. The problem I tried to bring out was that in all patients in whom even the slightest suspicion of colitis exists, very thorough studies should be done, including blood sedimentation rate and intestinal x-rays, for in segmental colitis or regional enteritis the diagnosis cannot be made on sigmoidoscopy.

I hesitate to operate upon patients with a possible diagnosis of ulcerative colitis, except to drain an abscess or perform a minimal surgical procedure for a painful posterior anal fissure. I would not elect to perform hemorrhoidectomy or any more extensive procedure in the anorectal region.

Treatment of Diverticulitis of the Colon

CHOICE OF OPERATION

HENRY K. RANSOM, M.D., *Ann Arbor, Michigan*

From the Department of Surgery, University of Michigan, Ann Arbor, Michigan.

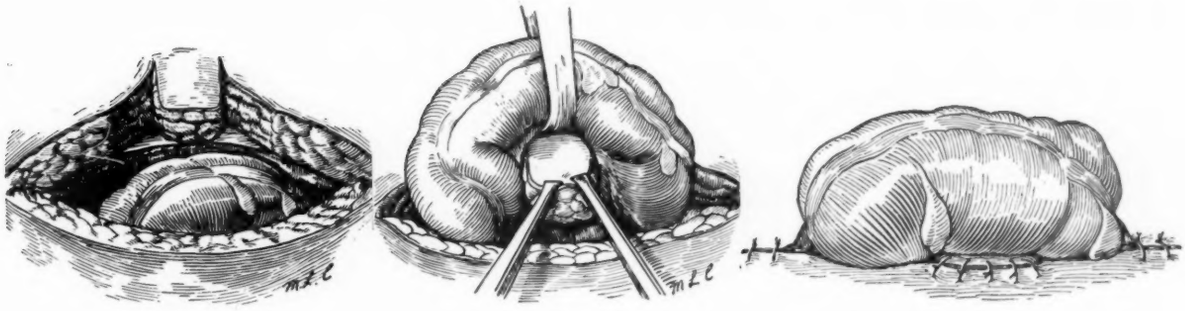
AT the present time, because of the greater life expectancy of the general population, the incidence of diverticulosis and diverticulitis is increasing. It is now generally agreed that resection is indicated for patients with recurring or persistent symptoms in order to prevent the several complications of the disease.

In 1953 a report was made detailing the experience in the University Hospital with regard to diverticulitis of the colon during the period 1934 to 1951.[1] Although in recent years one of every eight patients undergoing barium enema examinations was found to have diverticula of the colon, only sixty patients with colonic diverticulitis had been treated surgically during that period. Seven of these patients had cancer of the large bowel associated with diverticulitis, and one patient had acute inflammation of a diverticulum of the cecum. Thus there were fifty-two instances of the usual type of chronic diverticulitis. As in other reported series, the sigmoid was the area most frequently involved, although it was noted that diverticula were frequently present in the colon proximal to the sigmoid and that in some instances there was extensive involvement of all or nearly all of the colon.

Conservative emergency or palliative operative procedures were carried out in fourteen cases; in every case the need for operation arose from complications of the original disease. Three general categories of conditions required operation: (1) obstruction, (2) perforation with pelvic abscess, and (3) perforation with general peritonitis. The results of these simple palliative procedures were as follows: In four cases in which incision and drainage of a pelvic abscess was carried out, there was one postoperative death, one death from a second perforation of the sigmoid eight years later, and two long-term survivals without recurrence of the disease. In six cases in which only colostomy was performed, there was one subsequent closure of the colostomy with a satisfactory clinical result; however, three patients had died at periods ranging from three months to five and a half years, the colostomies in these cases never having been closed. One patient was living twelve years later but with a colostomy, and in one case resection was planned prior to closing the colostomy. In three cases of cecostomy there were two postoperative deaths from sepsis while one patient was free of symptoms two and a half years later although this cecostomy had required operative closure.

In the remaining thirty-eight cases definitive operative procedures were performed. The several types of operation were as follows: three-stage resection, seventeen; one-stage resection, fourteen (one postoperative death); obstructive resection, three; abdominoperineal resection, two; and subtotal colectomy, two (one postoperative death).

The results of definitive surgical treatment, as evaluated by limited follow-up examinations, were very satisfactory. In common with other articles,[2-4] this report stated the conclusions that simple conservative operative procedures have now become outmoded and that they have little place in the treatment of diverticulitis except as a method of dealing with complications or as a preliminary to resection. If surgical treatment is indicated, ordinarily the operative program should include resection of the diseased segment of the colon. Moreover, in view of the long hospital stay with the multiple operative procedures and the possibly dangerous illness of patients who may have perforation and abscess or peritonitis, it was believed that definitive surgery should be



1 2 3

FIG. 1. Technic for transverse colostomy. A right upper quadrant transverse incision has been made and the right transverse colon delivered into the wound.

FIG. 2. A bridge of skin is developed from the upper part of the incision and drawn through an opening in the transverse mesocolon. The wound is then closed.

FIG. 3. The colon will be completely transected in forty-eight hours. The bridge of skin serves to separate the two stomas, thereby completely defunctioning the left colon. (Figures 1 to 3 redrawn from: Coller, F. A.: Modern techniques in the surgery of the colon. *Proc. Roy. Soc. Med.*, 47: 1085, 1954.)

more frequently advised in the case of patients with diverticulitis who have recurrent or persistent symptoms in order to prevent the development of these serious complications. In such cases it was suggested that a one-stage procedure would ordinarily be feasible.

Since 1951 twenty-eight additional patients with colonic diverticulitis have been treated surgically. Of these cases, there was one instance of acute diverticulitis involving a diverticulum of the cecum which was incorrectly diagnosed as acute appendicitis. At operation, resection of the cecum was successfully accomplished. In one case incision and drainage in addition to transverse colostomy was carried out in a patient very ill with perforation and general peritonitis. The patient died shortly after operation and the diagnosis was verified at autopsy. The remaining twenty-six definitive operations may be classified as follows: one-stage resection, twelve; three-stage resection, eight; partial or subtotal colectomy with ileosigmoidostomy, four; and, two-stage resection, two.

A three-stage resection was performed in eight cases. This procedure, which consists of preliminary transverse colostomy, subsequent resection with anastomosis and finally closure of the colostomy, is the most conservative and safest form of surgical treatment. In this group of eight cases the indications for surgical treatment were as follows: perforation with pelvic abscess, three; perforation with general peritonitis, two; recent acute diverticulitis perforation, one; acute diverticulitis with bladder fistula, one; and probable bladder fistula, one.

The clinical improvement of patients following the establishment of the colostomy is often dramatic. Transverse incision of the right upper quadrant of the abdomen is preferred and the colostomy is made in the right portion of the transverse colon. The colostomy should be an exclusion type for defunctioning of the left colon. Thus a bridge of skin is brought between the two transected bowel ends. (Figs. 1 to 3.)[5] The general condition of the patient along with the radiologic findings on subsequent barium enema examinations will ordinarily determine the time when the resection may be safely performed. The latter examination will also assist in determining the extent of the resection. In the present series the interval between the colostomy and resection was slightly over six months. The postresection barium enema studies will also yield valuable information concerning the time for closure of the colostomy. There should be no evidence of stricture at the anastomosis and no escape of barium at the anastomotic site indicative of leakage. If all of the findings are satisfactory, the colostomy is closed approximately one month following resection. A point of interest is the fact that in this series of twenty-six cases the three-stage operation was chosen for only eight patients, whereas in the earlier series it was used in seventeen of thirty-eight cases. Although a one-stage procedure is preferable from the viewpoint of time, convenience, etc., the three-stage operation occupies an important place when perforation has occurred with

formation of an abscess or fistula or general peritonitis, and this procedure cannot be completely abandoned. The one-stage resection was employed in twelve cases and the indications for surgical treatment in these were as follows: recurring bouts of diverticulitis, nine; subacute obstruction, one; fistula of the bladder, one; and probable carcinoma of the sigmoid, one.

The one-stage procedure is best suited for cases of symptomatic diverticulitis without complications, cases in which hemorrhage is the major problem and those cases in which carcinoma is suspected. The complications of perforation (i.e., abscess, peritonitis or fistula) and obstruction usually require a period of defunctioning of the left colon by means of a preliminary colostomy.

In our early series the one-stage operation was used in fourteen of thirty-eight cases, and in this latest series in twelve of twenty-six. With resection being advised more frequently in cases of uncomplicated diverticulitis, it is obvious that the one-stage procedure can be employed more frequently than has been true in the past.

The two-stage operation (resection with simultaneous transverse colostomy) was rarely performed. This procedure is indicated chiefly when an anastomosis is made in unhealthy tissue or when the blood supply of the bowel ends is questionable and there is danger of leakage. Transverse colostomy will serve as a protection and is superior to a simple vent (i.e., cecostomy) as far as safety is concerned. The need for operative closure is an obvious disadvantage. Another indication for simultaneous transverse colostomy is small caliber of the bowel, so that the resultant stoma is narrow and obstruction may occur. However, a complementary cecostomy would probably serve equally well in such instances. There were two cases in which the two-stage procedure was performed. In one there had been a recent acute attack and possibly the definitive resection was carried out too soon after this episode. In the second case the surgeon was concerned about the integrity of the anastomosis.

Obstructive resection was not used in any of the cases in this group. Although on rare occasions this method may be useful in dealing with acute perforations, in our opinion it is not a satisfactory mode of resection in chronic diverticulitis.

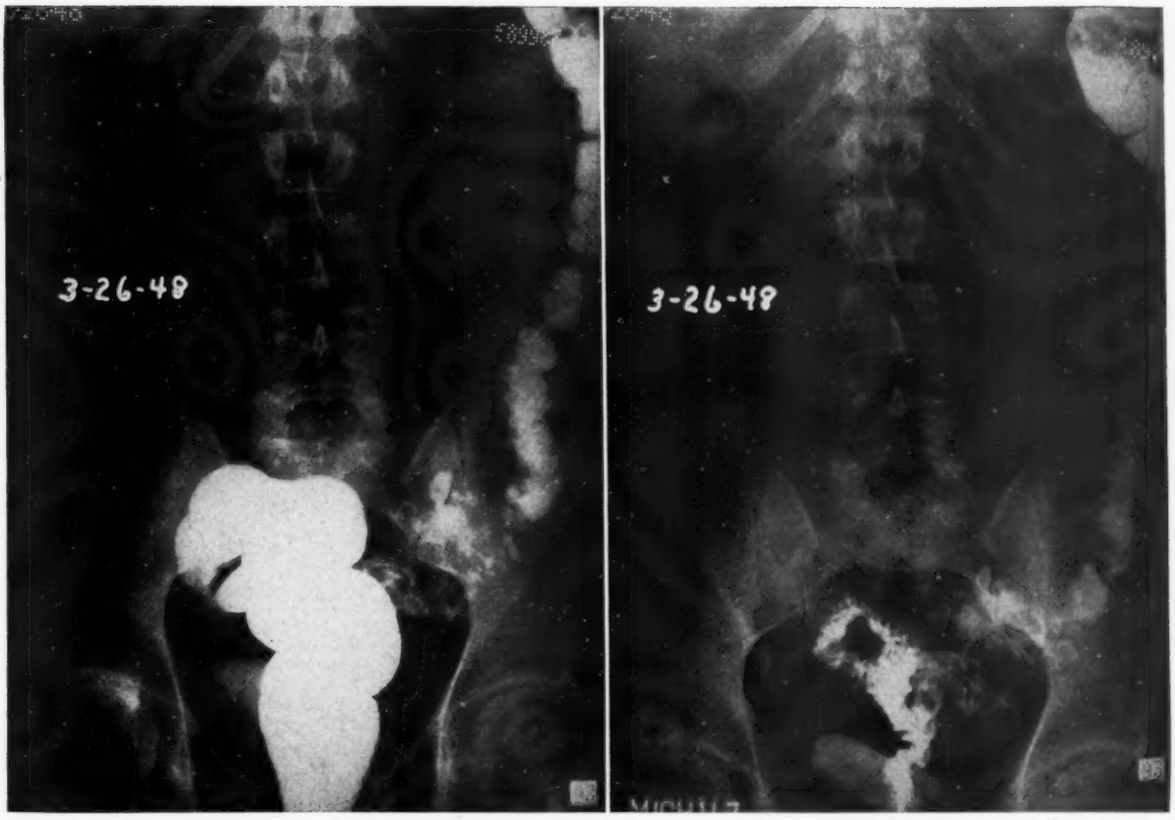
Partial or subtotal colectomy with restoration of intestinal continuity by low ileosigmoidostomy was performed in four cases. In one of these a planned one-stage subtotal resection was executed, the patient's symptoms being those of recurrent diverticulitis but with radiologic findings of extensive involvement of the entire colon. In two cases the problem was complicated by obstruction, hernia, fistulas, etc., following previous operations, and the more extensive resection provided the simplest solution. In one of the cases a usual type of three-stage operation had been planned. Following the second session, which consisted of resection of the sigmoid and descending colon, general peritonitis ensued. This was believed to be due to perforation of a residual diverticulum above the anastomosis or a leak at the anastomotic site. Subsequently, further resection and reconstruction by ileosigmoidostomy gave a satisfactory result.

COMMENT

In our experience hemorrhage has not been an important problem. It has been noted in approximately 17 per cent of the patients treated surgically. The bleeding with one exception was not severe, was sporadic in character and presented no additional problem. In only one case was massive hemorrhage encountered; in this case diverticula were present throughout the entire colon, requiring a subtotal resection. When hemorrhage is massive or frequent or when it is the chief or sole symptom, carcinoma of the colon associated with diverticulitis should be suspected.

Perforation with pelvic abscess is frequently encountered. In such cases it is our belief that transverse colostomy should be performed as the first stage of a three-stage resection. Conservative measures including antibiotics should be given a trial in the hope that subsidence of the abscess will occur or that perforation into the bowel will provide drainage. If this fails, surgical drainage becomes necessary; in most cases, however, a persistent fistula results. In such cases, when a sigmoidovesical or other type of internal fistula has developed, we believe that the three-stage procedure will ordinarily be indicated.

Perforation with general peritonitis is occasionally seen. The diagnosis may be difficult and an incorrect diagnosis of acute appendicitis with perforation or other acute abdominal



4A 4B

FIG. 4. Radiologic demonstration of sigmoidovesical fistula due to sigmoid diverticulitis. A, barium enema has been administered. Note the barium-filled rectum in contrast to the less dense shadow of the bladder. Barium has passed through the fistulous opening and has become diluted with urine. B, postevacuation film showing rectum nearly empty, but barium still retained in the bladder.

emergency is frequently made and the correct diagnosis established only at the time of laparotomy. Perforation of diverticulitis of the sigmoid with general peritonitis is a surgical emergency and the treatment of choice is the establishment of a transverse colostomy and, if possible, closure of the opening in the sigmoid along with adequate drainage of the pelvis. Subsequent resection and ultimate closure of the colostomy can be considered at the proper time.

In cases of fistula of the bladder a three-stage procedure is advisable. (Fig. 4.) In our experience, by the time the resection is performed the fistulous opening will have completely closed or will have become a very tiny opening. Closure of the bladder therefore presents no unusual or difficult surgical problem.

A fairly large group of cases remains in which it is impossible by clinical and radiologic means to rule out the presence of a neoplasm of the sigmoid absolutely. Some of these patients have only trivial symptoms; others have varying degrees of hemorrhage and others show obstructive phenomena. In fact, all of the complications of diverticulitis of the sigmoid may occur with carcinoma of the sigmoid. In cases in which any doubt exists, prompt resection is mandatory. The type and extent of the resection will be determined by the operative findings, but a single stage procedure will usually be possible.

In the past the standard type of colonic resection for diverticulitis of the sigmoid has been segmental resection of the involved sigmoidal loop; surgical specimens measuring 12, 15, 17 or 20 cm. in length have been considered indicative of an adequate resection. (Fig. 5.) Even though a few diverticula might be observed in subsequent roentgenograms of the descending or transverse colon, they have frequently been regarded as inconsequential

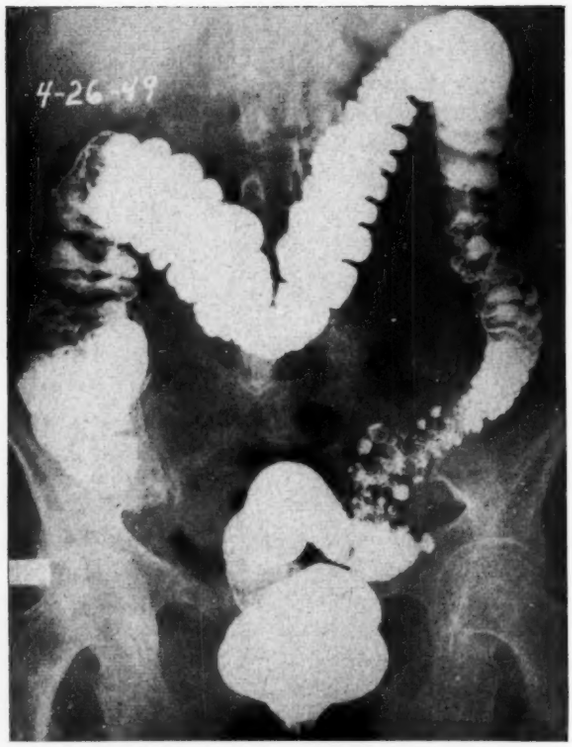


FIG. 5. Roentgenogram showing sigmoid diverticulitis. Diverticula limited to sigmoid area. Patient treated by one-stage resection of sigmoid.

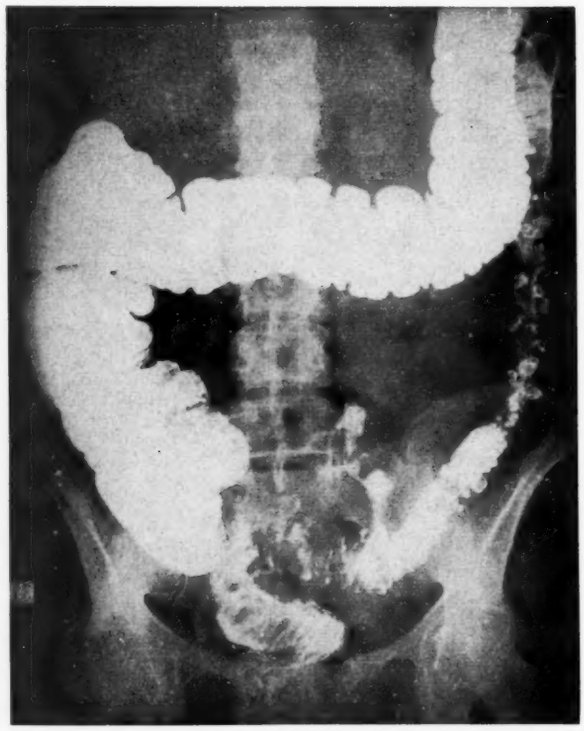


FIG. 6. Roentgenogram showing diverticulitis of sigmoid with perforation and pelvic abscess. Note the scattered diverticula in the descendens. Patient treated by three-stage operation with left hemicolectomy.

and of no particular import. With increasing experience it now appears that in many cases a more radical resection should be performed. Thus a left hemicolectomy with an anastomosis between the mid-transverse colon and the upper rectum may be necessary.[6] The diverticula so often allowed to remain in the descending or distal transverse colon following simple excision of the sigmoid may not be entirely innocuous. (Fig. 6.) These diverticula may subsequently perforate or they may be associated with sufficient inflammation in the adjacent bowel wall or surrounding tissues to endanger the anastomosis, and in a certain number of cases may be responsible for recurrent symptoms. As a rule, residual diverticula in the proximal half of the colon are not very likely to cause trouble. Nonetheless, when radiologic studies have shown extensive diverticulosis and diverticulitis, probably subtotal colectomy with ileosigmoidostomy is the preferable procedure if resection is to be performed. In extensive diverticulitis of this sort the chief risk from the diverticula in the right colon is the possibility of massive hemorrhage.

SUMMARY

Surgical treatment is indicated not only for the complications of diverticulitis of the colon but also for chronic diverticulitis with recurring attacks. In such cases operation should be advised in order to prevent the grave complications of perforation, fistula and obstruction.

Definitive surgical treatment should include resection of the diseased segment of bowel, with ultimate restoration of intestinal continuity. In some cases resection of the involved sigmoidal loop is insufficient because of the presence of numerous diverticula in the descending or transverse colon. In such cases left hemicolectomy is preferable. In rare instances subtotal colectomy is indicated. A permanent colostomy is almost never necessary.

A three-stage operation, consisting of right transverse colostomy, resection and closure of the colostomy, is the safest procedure. It is indicated in cases of perforation with pelvic abscess or general peritonitis, in patients with obstruction and in patients with fistula of the bladder or other sites. The one-stage operation may be safely employed in patients with recur-

ring episodes of diverticulitis, in those with hemorrhage and in those cases in which carcinoma is suspected or cannot be excluded. Obstructive resection and combined abdominoperineal resection are practically never indicated.

In a series of patients treated surgically at the University of Michigan Hospital, hemorrhage as a complication was not an important problem; it was noted in about 17 per cent of the cases. Such bleeding is usually very moderate and intermittent. When hemorrhage is the chief or sole symptom and when it occurs frequently, carcinoma should be suspected and operation should not be delayed too long.

In our group of cases fistula of the bladder did not present any particular technical problems. When a three-stage operation was performed, the fistula had completely or practically closed by the time of the resection.

REFERENCES

1. Ransom, H. K. Diverticulitis of the colon. *Gastroenterology*, 26: 12, 1954.
2. Boyden, A. M. Surgical treatment of diverticulitis of the colon. *Ann. Surg.*, 132: 94, 1950.
3. Smithwick, R. H. Experiences with surgical management of diverticulitis of the sigmoid. *Ann. Surg.*, 115: 969, 1942.
4. Welch, C. E., Allen, A. W. and Donaldson, G. A. An appraisal of resection of the colon for diverticulitis of the sigmoid. *Ann. Surg.*, 138: 332, 1953.
5. Coller, F. A. Modern techniques in the surgery of the colon. *Proc. Roy. Soc. Med.*, 47: 1085, 1954.
6. Gilchrist, F. A. and Economou, S. Surgical treatment of diverticulitis of the colon. *Arch. Surg.*, 70: 276, 1955.

Factitial Proctitis

THE ROLE OF LYMPHATIC DESTRUCTION

J. F. WENZEL, M.D., *Detroit, Michigan*

FACTITIAL proctitis, resulting from the use of radium in the treatment of carcinoma of the cervix, has been described as an inflammatory process,[1] as an endarteritis,[11] and as being due to mucosal sensitivity to irradiation.[12] Little emphasis has been given to the destruction of lymphatic tissue. The shift of tissue reaction from the cervix to the rectum and the delayed appearance of rectal changes suggest that lymphatic destruction is a basic factor in factitial proctitis.

When the effect of radiation is on the mucosal cells only, the proctitis is mild and transitory and not in the scope of this discussion. In the early phase, only mucosal reaction to the rays with congestion, hyperemia and punctate erosion is present. Later, submucosal lymphatic destruction is noted by a soft doughnut stricture of lymphedema opposite the cervix and encircling the rectum. On bidigital examination, this soft doughnut mass is found to be separate from the cervix. Later, on the anterior wall of the rectum, trophic slough (aseptic necrosis) produces an ulcer, the base of which is covered with a white, grayish membrane of dead tissue. As the ulcer deepens, the rectal wall perforates. Depending upon the site of perforation, rectovaginal fistula, cul-de-sac abscess or pelvirectal abscess may develop. Lymph stasis and infection stimulate fibroblastic proliferation which results in an encircling connective tissue stricture.

The encircling nature of the rectal pathology suggests a lymphatic disturbance at the site, for as shown by Maximow and Bloom,[10] the lymphatic network, especially in the submucosa, encircles the rectum. Consequently in factitial proctitis, and in other intestinal diseases having a predilection for the lymphatics, the stricture encircles the bowel.

When tissue is radiated, there can be no question that exposed lymphatics are destroyed. Since Heineke's[3] pioneering research thirty-five years ago on the total radiation of laboratory animals, it has been known that the bone marrow and the lymphatics are the most sensitive tissues to ionizing radiation. The lymphatic cells go through the following phases: (1) destruction; characterized by disintegration of cells; (2) active phagocytosis of cellular debris; (3) atrophy; or (4) regeneration. In lymphoid tissue, complete recovery is slow.[3]

In studying the radiation effects of atomic weapons, the Los Alamos Scientific Laboratory[4] found that lymphoid tissue was the most sensitive of all tissues studied postmortem. "The mucus linings of the intestinal tract were among the first tissues to show gross changes. Patches of lymphoid tissue were especially involved. At times a diphtheria-like membrane covered the mucus lining and sometimes the tissues underneath were swollen and waterlogged."

The complete destruction of the submucosal lymph aggregates in the colon following irradiation of the cervix has been demonstrated in microscopic studies.[6] This cellular destruction is caused by ionization.[2] The process requires but a few moments. The rays do not remain in the body, but the damage produced in lymph aggregates can cause their disintegration. Active phagocytosis of the cellular debris ensues. The debris must be carried away by the lymphatics. But if the lymphatics are destroyed, their function cannot be performed. According to Nash,[8] "the lymphatics can carry material in only one general direction, namely, from the tissues to the blood. The walls of the lymph vessels have been shown to have irreversible permeability to particulate foreign matter of large size, for the lymphatic system would be ill adapted to its function if,

when substances had been collected within its vessels, they were unrestrained and likely to escape again." When the lymphatic chain becomes blocked with the particulate matter of cellular disintegration, the lymph encircles the bowel to seek a path of escape and an annular form of lymphedema results. As explained by Campbell et al,[13] "Chronic lymphedema is a progressive disease. With lymphatic stasis a fluid which has a high protein content collects in the intersitial spaces. The edema fluid stimulates fibroblastic proliferation. The resultant fibrosis further contributes to the stasis and reduces resistance to infection. There follows a vicious cycle of obstruction, edema, fibrosis and infection."

The following eight cases from a personal series were chosen to demonstrate various phases of factitial proctitis.

CASE REPORTS

CASE I.* B. M., a forty-two year old white woman, was treated on January 28, 1949, with 4,400 mg. hours of radium for a United Nations grade I carcinoma of the cervix for which she had previously received deep radiation. On November 17, 1950, digital examination revealed a napkin ring stricture of the mid-rectum which would not admit the index finger. A typical radiation ulcer was found on the anterior rectal wall. On January 31, 1953, an obstructing strictured angulated rectosigmoid, due to radiation disease, was removed and the bowel anastomosed; a complementary cecostomy was used. No carcinoma was found in the specimen. The previous low rectal ulcer and stricture were no longer present. The patient reported in good health and asymptomatic as late as December, 1955.

CASE II.† E. W., a fifty-three year old white woman, was treated with 6,480 mg. hours of radium for a squamous cell carcinoma of the cervix. On September 29, 1954, she required hospitalization because of severe rectal pain and diarrhea. Proctoscopic examination revealed a stricture and a deep ulcer on the anterior rectal wall. Distress was not relieved by the use of cortisone orally and opiates were not effective. On October 12, 1954, transverse colostomy was performed. During the following year there was persistent pain caused by an active proctitis. On November 4, 1955, proctosigmoidectomy was performed. There was no evidence of carcinoma. Pathologic study of the removed rectum revealed a collagenous connective tissue fibrosis; telangiectatic venules and capillaries, and absent submucosal lymphatics. The colostomy was closed on November 21, 1955, and a presacral abscess required drainage on November 28, 1955. Complete local healing ensued.

CASE III.* S. McI., a forty-three year old white woman, was treated on January 20, 1950, with an inadvertent dosage of radium for preinvasive squamous cell carcinoma of the cervix. Rectal pain began on September 12, 1950. By December 19, 1950, a barium enema study reported: "Mass involvement of the mid-rectum by an apparent malignant process with actual ulceration of the anterior rectal wall and the escape of barium into the perirectal spaces." A biopsy specimen of the rectum revealed radiation disease. On December 22, 1950, a combined panhysterectomy and Miles' abdominoperineal resection of the rectum were performed. The pathologic report was, "No evidence of carcinoma of the cervix, uterus, ovary or rectum; severe proctitis." Three months later a vesicoperineal fistula developed which was subsequently repaired via the suprapubic approach. In December, 1955, the patient reported in excellent health and was working daily in a factory.

CASE IV.† F. L., a seventy-three year old white woman, had an unknown amount of radium implanted in the cervix for carcinoma in 1936. She was seen in a local clinic in 1946 with a recurrent factitial proctitis stricture which barely admitted the index finger. On August 7, 1955, she was admitted to the hospital with persistent diarrhea and abdominal pain due to membranous coloproctitis. Barium enema study reported, "narrowing at the rectosigmoid probably due to previous irradiation." A ¾ inch sigmoidoscope could be passed through the formerly strictured rectum; dead membrane hanging in sheets of slough tissue were pulled away from the wall of the rectosigmoid and punch biopsies were taken from the red, bleeding base. The microscopic diagnosis was subacute granulomatous non-specific proctitis. Spontaneous resolution occurred without drugs or surgery, the patient refusing all types of medication. The course demonstrates persistent low resistance to recurrent infections in bowel known to have suffered from factitial proctitis.

CASE V.† J. S., a seventy-two year old white woman, was treated with 5,400 mg. hours of radium for a squamous cell carcinoma of the cervix, histologic grade III on October 22, 1951. By March 10, 1953, a rectovaginal fistula had developed and

* Case I, Holy Cross Hospital.
† Case II, Detroit Memorial Hospital.

* Case III, East Side Hospital.
† Cases IV and V, Detroit Memorial Hospital.

a hard painful mass was present in the pelvis. On March 13, 1953, a combined panhysterectomy and Miles' abdominoperineal resection with removal of the posterior vaginal wall was performed. The pathologic report was; (1) rectovaginal fistula with postradiation status of the rectal wall; diffuse hyalin fibrosis, focal edema, thrombotic arteries; (2) leiomyomata corpus uteri; (3) radiation atrophy of right ovary; (4) calcified cyst of left ovary; (5) atrophic endometrium. The postoperative course was uneventful and the patient reported in good health in December, 1955.

Case vi.* I. U., a fifty-three year old white woman, had been treated on November 23, 1951, with 5,280 mg. hours of radium for squamous cell carcinoma of the cervix, United Nations grade 1, followed with 8,160 r through four ports. On March 31, 1953, a rectovaginal fistula developed 2 inches above the anus with a rectal stricture which did not admit an index finger. There were painful, frequent stools. On October 13, 1955, proctosigmoidectomy was performed. Because of extensive fibrosis the posterior vaginal wall was removed. Microscopy revealed necrosis of the surface epithelium; profuse fibrosis of the wall; dilated lymphatic vessels; absence of lymphatic cells in the submucosa; the arteries hyalinized and thickened. The patient died on the eleventh postoperative day of beta hemolytic streptococcus enterocolitis.

Case vii.† J. L., a forty-two year old white woman, had an inadvertent amount of radium applied to a carcinoma of the cervix on June 12, 1949. By December 5, 1949 she was bedridden with constant rectovaginal pain and repeated severe hemorrhages caused by an acute factitial proctitis. On December 7, 1949 a right transverse colostomy was performed. Progressive rectovaginal slough ensued and the patient died three months later of urinary complications.

Case viii.‡ H. S., a sixty-eight year old white woman, was treated on July 5, 1946, with 4,800 mg. hours of radium for an early squamous cell carcinoma of the cervix. On June 5, 1947, she was admitted to the hospital with recurrent rectal hemorrhages and painful diarrhea. The vagina was closed to the examining finger. Painful rectal examination revealed a stricture at the mid-rectum and an anterior radiation ulcer. Colostomy was not performed. Intestinal antisepsis and multiple transfusions were given over a prolonged period. When seen on September 10, 1951, she had been free of rectal symptoms for eighteen months. She was seen again in April, 1954, during the course of a cholecystectomy, and stated she had suffered no further rectal disturbance.

* Case vi, St. John Hospital.
† Case vii, East Side Hospital.
‡ Case viii, Detroit Memorial Hospital.

COMMENTS

In the eight cases chosen as representative of various phases of factitial proctitis, the following points are of interest:

1. A spontaneous resolution of a rectal stricture occurred in three cases.
2. Transverse colostomy in two patients had little noticeable effect on the course of the factitial proctitis.
3. Resection was chosen in five cases for tissue destruction beyond recovery.
4. A rectovaginal fistula developed in three patients; a rectal perforation and abscess in one; and a rectal ulcer without further complication in three patients.
5. A rectosigmoid perforation occurred in one case, and a rectosigmoid stricture in two cases.
6. Rectal stricture occured in all cases.
7. A preoperative evaluation of probable pelvic carcinoma were made in three of the five resected cases. In no instance was carcinoma present.

CONCLUSION

Factitial proctitis is a disease of mucosal and lymphatic cell destruction with fibroblastic proliferation, hyaline degeneration and endarteritis resulting from the use of radium in the treatment of a malignancy in the cervix. Tissue ionization produces biologic effects causing degeneration of the sensitive mucosal cells and the lymph aggregates in the submucosa. When radiation destroys the lymphatics of the rectum the lymphatic block results in lymph edema with doughnut stricture. Subsequent fibroblastic proliferation and the accompanying endarteritis result in stricture, slough and perforation; secondary infection superimposes an inflammatory condition.

Usually there is spontaneous resolution. In the average case intestinal antisepsis and supportive blood transfusions are sufficient to control proctitis and loss of blood. In severe cases proximal colostomy can reduce bleeding and place the diseased area at rest but is probably no more curative than colostomy in the treatment of lymphopathia venerea or than ileostomy in the treatment of ulcerative colitis.

In chronic cases, if the fibrosis, endarteritis and infection result in cellular destruction

beyond regeneration, surgical decision should be directed toward resection of all diseased tissue.

REFERENCES

1. Bacon, H. E. Anus, Rectum, and Sigmoid Colon, 3rd ed., vol. 1, pp. 260, 340. Philadelphia, 1949. J. B. Lippincott Co.
2. Glaser, O. Medical Physics. In: Faille, G. Ionization in Tissue, p. 637. Chicago, Ill., 1944. Yearbook Publishers, Inc.
3. Heineke. Ionizing radiation and blood forming tissues. Editorial. *J. A. M. A.*, 144: 1182, 1950.
4. Los Alamos Scientific Laboratory, Effects of Atomic Weapons; revised Sept., 1950. Los Alamos, New Mexico, p. 351.
5. Karlan, A. G. and Gainer, J. H. Viomycin in tuberculosis of guinea pigs. *Proc. Staff Meet., Mayo Clin.*, 26: 53, 1951.
6. U. S. Naval Medical School, Color Atlas of Pathology, p. 61. Philadelphia, 1950. J. B. Lippincott Co.
7. Anderson, W. A. D. Synopsis of Pathology, 2nd ed., p. 31. St. Louis, 1946. C. V. Mosby Co.
8. Nash, J. Surgical Physiology, 6th ed., pp. 236–237. Springfield, Ill., 1950. Charles C Thomas.
9. Willis, R. A. The Spread of Tumors in the Human Body, p. 7. London, 1934. J. & A. Churchill Co.
10. Maximow, A. and Bloom, W. A. Textbook of Histology, pp. 523, 526. Philadelphia, 1930. W. B. Saunders Co.
11. Cutler, M. Complications of radio-therapy in cancer of cervix. *Surg., Gynec., & Obst.*, 74: 867, 1942.
12. Aune, E. F. and White, B. V. Gastrointestinal complications of irradiation of uterine cervix. *J. A. M. A.*, 147: 831, 1951.
13. Campbell, D. A., Glas, W. W. and Musselman, M. M. The surgical treatment of massive lymphedema of the lower extremities. *Surgery*, 30: 763, 1951.
14. Pratt, G. N. Surgical correction of lymphedema. *J. A. M. A.*, 147: 1121, 1951.

DISCUSSION

Lloyd F. Sherman (Minneapolis, Minn.): I would like to compliment Dr. Wenzel on his paper, particularly on the representative group of cases that clearly illustrate the numerous facets of this destructive process which we call factitial proctitis.

Dr. Wenzel has emphasized a heretofore unstressed phase in the pathogenesis of this process and his theories propose an interesting hypothesis. I wonder if he really means to describe the effects of radiation on lymphoid tissues and lymphatic vessels as being one and the same.

We are all agreed that lymphoid aggregates, particularly in the intestine, are quite radiosensitive. However, I question whether lymphatic vessels *per se* are any more easily damaged by radiation than the small end arteries of the veins and colon and rectum.

I believe (and it is the consensus of the pathologists at the University of Minnesota) that most likely the sequence of events in the pathogenesis of this lesion is as follows:

The vascular endothelium is first damaged. This is followed by clotting of the small capillaries, with subsequent infarction. This is apparent in all early inflammatory reactions, in that the initial stage is one of edema and exudation with early changes and repair.

If Dr. Wenzel were correct, one would expect severe damage at the site of bowel anastomosis, for certainly at this point the lymphatic vessels are interrupted by a surgical procedure.

The fact that Dr. Wenzel's paper raises a question as to the exact nature of the pathogenesis of factitial proctitis should be a stimulus for those who are interested in the pathologic research to further investigate this problem.

We have been following this problem rather closely except for one interruption at the University of Minnesota in the past three years. Dr. Kaplan, from Hartford, Connecticut, our former resident, has an excellent exhibit on this which portrays our original findings.

However, we have largely concerned ourselves with a clinical investigation in an attempt to alleviate symptoms and deter advancement of tissue damage. In our hands the topical application of hydrocortisone in water-soluble base has been our best weapon. Certainly further investigation in particularly the pathogenesis of this problem is in order.

Sidney M. Copland (Dayton, Ohio): In the last two and a half years I have seen over twenty cases of factitial proctitis; I think that is a rather high incidence.

This particular disease is distinctly on the increase. Why? Because in every community the question of who gives radiation therapy varies. In the larger city it is the gynecologist. Sometimes the x-ray man gives it. I do not say that every case of factitial proctitis is due to imperfect technic, but many cases are due to imperfect technic and I think the incidence can be materially lessened by more care at the time of the original radiation.

This disease, in my experience, is not self-limited. Many of these cases go on to chronicity, creating rectal cripples. We do have irreversible bleeding in many patients and surgery is indicated. More and more of these cases are going to reach colostomy and abdominoperineal resection. It was thought in the relatively recent past that this was a self-limited disease and that surgery was very rarely indicated. I do not think that will hold up, nor is it holding up today.

Do not take the appearance of the mucosa through the sigmoidoscope as definite evidence for the diagnosis. A biopsy specimen should be

taken the very first time the patient is examined because of the possibility of malignant spread into the rectovaginal septum and into the rectum proper.

FREDERICK VOGEL (Brooklyn, N. Y.): I should like to ask Dr. Wenzel one question: Two years ago in Los Angeles an excellent paper was presented on the treatment of factitial proctitis. If I remember correctly, seven patients had been treated successfully with cortisone.

From what you have shown, Dr. Wenzel, and in particular from the histopathology of the cases demonstrated, would you consider placing this condition in the category of granulomatous collagen disease due to radiation? If so, could this account for the successful response to cortisone as reported?

JACOB F. WENZEL (closing): The pathologic picture described by Dr. Sherman is a standard one found in all textbooks. I do not believe that the standard textbook description satisfies in regard to what I see in the patient with destructive factitial proctitis. After all, collateral circulation has a long time to develop and compensate for poor nutrition due to endarteritis.

As far as damage to lymph vessels is concerned, there is absolutely none; the damage is to the lymph cells. The vessels, in fact, are frequently found to be dilated because of the extra load placed upon them.

One might also ponder why there are dilated veins in these cases. The veins must take over some of the function of the lymph vessels.

I have had no experience with presacral neurectomy to control the pain in these cases.

In one of the slides shown* large areas of skin slough can be seen. The same picture was present suprapubically. This woman had had deep x-ray therapy for carcinoma of the uterus six years previously. Not until complete removal of all diseased tissue, with plastic surgery, was there some success in controlling the disease. This disease starts inside the tissue and sloughs outward. It is not a matter of infection beginning on the skin and working its way into the body.

Regarding cortisone therapy, I should not comment upon it because I have used it so little. I would expect it to have a considerable effect in the inflammatory reaction stage. However, if the disease processes are such as we have described, and if I interpret the remarks of previous speakers at this convention correctly, cortisone must remain the dream of the internist and not the dream of the surgeon.

I state the foregoing in perfect cognizance of the tremendous relief given patients with the use of cortisone topically in low rectal and anal lesions. If you use cortisone in treating ulcerative colitis, I think you will get equally beneficial results in the treatment of factitial proctitis.

* Dr. Wenzel illustrated his discussion through the use of slides.

Psychiatric Aspects of Proctologic Practice

RICHARD M. ALEXANDER, M.D., *New York, New York*

THE relationship between the psyche and physical illness has been a source of considerable interest to physicians for many years. Much of the clinical investigation has been directed toward the response of the gastrointestinal tract to psychic stimuli and the role of emotional stress in the genesis of peptic ulcer and ulcerative colitis. A careful survey of the literature reveals relatively few reports concerning psychosomatic anorectal ailments.

Psychoanalysis has developed an awareness that sexual excitation is not restricted to the genitals alone. In early childhood the anus and the process of defecation play an important role in the sexual development of the child; and as maturity is reached, these infantile pleasures cease to be consciously acceptable. This is significant because too much medication, manipulation and examination of the anus may elicit undue fear and embarrassment related to the stimulation of such unacceptable infantile pleasures. This emotional conflict may cause a patient to register unusual resistance to an order for an enema, or he may have excessive fear of a sigmoidoscopy.[1] This type of patient may be apprehensive to the point of panic during the initial stages of the proctologic examination and cannot maintain his position on the table despite the fact that the introduction of the sigmoidoscope causes no discomfort. It is not at all unusual for the average patient to be apprehensive. However, he submits to the examination and cooperates without difficulty.

Constant reassurance is necessary in the handling of all patients during examination, but in the excessively apprehensive group the physician should realize that frequent medication in the form of suppositories, enemas or salves, as well as excessive instrumentation, are contraindicated lest they lead to an accentuation of symptoms on a purely psychologic basis.

Many anorectal ailments are recognized as clinical entities but their etiology remains obscure. The psychiatrist believes some are purely psychogenic in origin, while many proctologists believe in a somatic origin with accentuation of symptoms under emotional stress. No attempt will be made to solve this dispute here, but it is hoped that some benefit will be obtained by recognizing the psychodynamics which undoubtedly play some role in the genesis or persistence of symptoms.

SCHIZOPHRENIA

Most proctologists have encountered patients who complain of an odor of flatus or feces which is constantly present and which they claim can be detected by everyone around them. Such persons with olfactory hallucinations seek relief from an imaginary proctologic illness and pose a formidable therapeutic problem. A diagnosis of schizophrenia can be made in many patients so afflicted. The patient with these complaints usually has the following characteristics:[2] (1) scrupulous cleanliness; (2) treatment by other physicians without success; (3) an assortment of other rectal symptoms which they use as an excuse for seeking medical aid; (4) the delusion of a persistent odor which is detected by everyone around him and the paranoid feeling that people move away because of this, or that people are disgusted by the individual himself; (5) practically no patient imagines agreeable odors but usually only those of organic body origin.[3,4]

Operative procedures in these patients should be carefully considered because of the danger of precipitating an acute psychosis. In any event, operation will not cure such a patient and psychiatric help is imperative. Such individuals usually have been told that they need psychotherapy and have no insight into their illness. Considerable tact and understanding on the part of both the physician and the family of the patient must be exercised so that psychiatric care can be rendered.

PROCTALGIA FUGAX

Proctalgia fugax is clinically characterized by recurring paroxysms of rectal pain. At onset the pain is mild, gradually increases in intensity, reaches a peak and then subsides. The duration may be from a few minutes to half an hour or more and may be accompanied with perspiration or even fainting. The pain most commonly occurs at night but may arise at any time during the day or night. Attacks occur at intervals of many weeks or months.

The exact location of the pain seems to vary from patient to patient, but the pain usually recurs in the same place in any one person.

The pain has been described in many ways but usually resembles a cramp deep in the pelvis and is definitely not anal in location.

Many etiologic theories have been suggested. Blyth[5] reports that attacks are precipitated by sexual intercourse, masturbation or nocturnal emission and may be associated with priapism.

Proctalgia fugax is thought by many to be psychosomatic in origin. During the day, attacks are admittedly precipitated by excessive emotional stress and anxiety. Nocturnal episodes accompany anxiety and profoundly frustrating dreams or nightmares, or the content of the dream may be erotic. The condition is seen frequently in patients with a fear of cancer.[6] Relief can be obtained by oral ingestion of calcium, by cold drinks, locally applied heat, passage of flatus or defecation. Ineffectual straining at stool may intensify or prolong spasm.[7]

Occasionally an unusual type of rectal cramping pain is experienced which cannot be classified as proctalgia fugax. A cramping pain occurs deep in the pelvis following sexual intercourse and may persist for several hours. It is followed with several days of constipation. In most instances no organic disease is present and none of the therapy outlined previously is effective. Psychoanalysis reveals that these patients are most commonly latent homosexuals who identify themselves with the female at the time of intercourse and have a rectal cramp as an orgasmic reaction. These patients have little insight as to the nature of their difficulty and should be referred for psychiatric treatment.

PRURITUS ANI

One of the most controversial ailments encountered in proctologic practice is pruritus ani. It is still an enigma and many questions are as yet unanswered:[8] (1) Is it a symptom or a disease? (2) Why are men more affected than women? (3) What is the significance of local perspiration? (4) What is its relation to depression and paranoid trends?

Pruritus ani needs no description to proctologists, but emphasis on the character of the itching is important. Itching occurs mostly at night and the patient awakens, not from itching, but from scratching and the pain which occurs as a result. Scratching and tearing often increase progressively until a climax is reached; the patient is left limp and exhausted, and is covered with perspiration. The analogy to masturbation is obvious but it is certainly not the entire explanation of pruritus ani.

The average patient with intractable pruritus ani has several personality characteristics. He is especially concerned about bowel function, and his daily routine in the choice of food, fluid intake and measured exercise reflects this. One of the most constant features is the eagerness of the patient to submit to local inspection; this eagerness is usually attributed to exhibitionism. Many of these patients will disrobe completely at each visit although they know it is unnecessary. This does not appear to be a homosexual manifestation since an equally striking characteristic is the absence of modesty in male patients. The veiled libidinal urge betrays itself by the very presence of modesty as demonstrated by blushing. Another conspicuous characteristic is the habit of regular self-inspection by means of mirrors.

Psychotherapy discloses that the male patient with pruritus ani has a deep-seated uncertainty and anxiety about the nature, function or possible change of his excretory and sexual organs. His urge to display the lesion amounts to an appeal for the doctor's opinion. Self-inspection is another attempt at reassurance.

It is common for patients with pruritus ani to be described as anal-erotic characters. In the true freudian concept this cannot be correct. Freud[9] reserved the term "anal-erotic" for those who had successfully withdrawn infantile interest in feces and defecation and sublimated it into certain character traits. Those who preserved their interest in the anal area, as patients with pruritus ani, do not fall into this category.

The patient's main concern is to keep the anus constantly and meticulously clean. Although the reason is given that he believes itching will be reduced, analysis reveals that the fetish for cleanliness is initiated by the

anxiety that something might "become lodged in the anus" or enter the body through it. Infection is feared from particles of fecal matter or from lavatory seats, and there is an imaginary fear that something is present in the stool which should not be there. Advising the patient to keep the anus scrupulously clean and the prescription of an involved regimen for accomplishing this serves to confirm and fortify the irrational fears which are present.

The simplest therapeutic measures which are found to be effective should be prescribed, and in the vast majority of cases relief will be afforded. Intractable cases will be helped considerably by psychotherapy.

CONSTIPATION

Constipation is one of the most frequent complaints in proctologic and general medical practice. Causes have been listed in modern medical and pediatric texts as: (1) insufficient or improper food, (2) insufficient fluids, (3) spasticity of the intestine, (4) anatomic abnormalities and (5) faulty habits.

Very little consideration has been allotted the emotions as an etiologic factor although a great deal of evidence supports such a thesis.[10] Constipation due to anatomic abnormalities is rare. Lack of muscular tone of the intestinal walls is a nebulous category and is also rare. Spasticity of the bowel and faulty habits contribute to a constipated state, but they are usually related to emotional factors.

In both adults and children feces have innumerable connotations depending upon the individual concerned. However, the problem in children is extremely important. The proctologist sees children in relatively small numbers in relation to the rest of his patients, but the majority of them have anal fissures and are constipated. The management of these patients must be both psychologic and physical. The mother should be especially oriented as to the psychologic problems without going into too much psychoanalytic detail.

It is generally accepted in psychoanalysis that to the young child feces are a valuable possession and a part of the body. When a suppository or enema is introduced into the anus of a child, mighty are the preparations of the mother. If the child is apprehensive (as most of them are), the anal sphincter contracts. The child will resist if the object is forced inside the rectum against a tight sphincter; and if water is forced in as well, the resistance is accentuated. The child feels overwhelmed by a large, forceful adult against whom he cannot release aggression. Someone has interfered with his attempts to control his own sphincter and retain his own feces.

In addition to the struggle of wills and the frustration of the child, there is overstimulation of the anal area. If the process is repeated frequently, the child will eventually wish for repeated enemas or suppositories because what originally seemed unpleasant in time became pleasurable. Continued stimulation acts as masturbation and can be carried into adult life as either actual introduction of foreign bodies into the anus or the more subtle type of condition such as pruritus ani.

Huschka[11] has discussed the relationship between coercive toilet training and constipation. When this is attempted too early by an overzealous mother, a similar set of circumstances can arise. The proctologist who is acquainted with the psychodynamics of bowel habit difficulties is in an excellent position to advise the care and management of the child. "The roots of chronic constipation grow in the soil of parental attitudes,"[10] and education of the parents is sorely needed. The parent should be told that the frequency of defecation is variable, that a child can have no bowel movement for several days without impairment of health. The mother's attitude about the filth of fecal matter must be re-evaluated since the child is proud of his own feces and the mother who rejects this concept is hurting the child. During toilet training the parent should adopt a sympathetic and reasonable attitude. The child may be afraid of the toilet but he wants approval and eventually will cooperate.

Many cases of constipation in children can be cured by reassuring the parent that the child is normal, that his rectum and anus are of normal size, and that by reduction of tension and anxiety in the parent the same thing will occur in the child. Frequently, permitting the child to play with clay will solve the problem, since the clay represents feces and the child wishes to play with feces, his proud possession. Clay and the process of finger painting act as symbols of fecal matter for the child and are extremely helpful in treating constipation in this age group.

COLITIS

It is generally accepted that mucous colitis is essentially psychogenic in etiology. Remissions

and exacerbations occur with changes in the emotional makeup, and examination of the gastrointestinal tract by means of x-ray, endoscopy and bacteriologic studies reveals no pathologic entity to account for the symptoms. I shall confine the remainder of this article to ulcerative colitis.

It cannot be disputed that the patient's mental state and the course of ulcerative colitis are intimately associated with each other. The etiology is still unknown but psychic factors are most important in the development and persistence of the disease. Skeptics as to the role of the emotions in the etiology of ulcerative colitis say that the psychiatric make-up of the patient is secondary to the disease; that anyone with a serious illness will be depressed and anxious. This is an admission of ignorance of the methods of psychosomatic diagnosis. One has only to examine the clinical picture, the factors which immediately precipitated the attack, the existence of previous neurosis and the basic personality of the patient in order to produce a psychosomatic etiologic thesis.

The potency of the precipitating situation is dependent upon the particular type of personality toward which it is directed.[12] The personality is especially vulnerable because of the persistence of emotional immaturities with marked inner dependence upon a parental figure, usually the mother. Precipitating situations are those which pose a serious threat to security such as loss of the supporting figure, financial disaster or the effect of engagement, marriage or childbirth. The immaturity is demonstrated by the inability of the patient to cope with the new situation. The same series of events repeated over and over again may cause repeated attacks.

The mothers of patients with ulcerative colitis generally have common personality characteristics. They are overanxious, overpossessive, oversolicitous persons who are usually the stronger of the two parental figures and who dominate the home.

Patients with ulcerative colitis also have a surprising number of personality traits in common:[13] (1) intellectual endowment—most patients with ulcerative colitis are above average in intelligence; (2) sense of neatness—the women with the disease especially are almost obsessive in their attempts to maintain rigid cleanliness and neatness both of themselves and their surroundings; (3) emotional tension—most patients are unable to throw off the effects of an emotional episode immediately; (4) financial worries; (5) marital and sexual difficulties; (6) abnormal attachments—the male patients especially are dependent upon their mothers or some other dominant female relative; (7) egotistic and narcissistic—ulcerative colitis patients do not tolerate emotional deprivations such as the loss of a close relative, nor can they consider the emotional reactions of others as is required in a compatible marriage. They resent giving of themselves as is necessary in rearing children.

The course of the disease fluctuates with changes in the emotional state and the patient usually recognizes this phenomenon. Psychiatric treatment of patients with ulcerative colitis has achieved limited success. A physician with a strong, self-confident personality who impresses the patient as a domineering figure can successfully treat that patient and remissions occur with minimal therapy. The doctor becomes a strong father figure and effects a transference of dependence from the patient's mother to himself.

CONCLUSION

A discussion of the psychiatric factors associated with clinical proctologic entities has been presented in the hope of creating a better understanding between doctor and patient. It is not the intent of this paper to establish definite psychogenic factors which must be present for a clinical syndrome to occur. A sizable proportion of proctologic patients are neurotic personalities, and we as proctologists must be able to recognize psychiatric aberrations which are associated with anorectal disease.

REFERENCES

1. Bellak, L. Psychology of Physical Illness. New York, 1952. Grune & Stratton.
2. Forte, F. S. Olfactory hallucinations as a proctologic manifestation of early schizophrenia. *Am. J. Surg.*, 84: 620, 1952.
3. Bromberg, W. and Schilder, P. Olfactory imagination and olfactory hallucinations. *Arch. Neurol. & Psychiat.*, 32: 467, 1934.
4. Alliez, J. and Noseda, M. Considerations, statistiques et cliniques sur les hallucinations olfactives et gustatives. *Ann. méd.-psychol.*, 103: 134, 1945.
5. Blyth, W. Proctalgia fugax. *Lancet*, 229: 404, 1935.
6. Gabriel, W. B. Principles and Practice of Rectal Surgery, 4th ed. London, 1948. Leeves.
7. Ewing, M. R. Proctalgia fugax. *Brit. M. J.*, 1: 1083, 1953.

8. Macalpine, I. Pruritus ani, a psychiatric study. *Psychosomatic Med.*, 15: 498, 1953.
9. Freud, S. Character and anal erotism (1908). Collected Papers, vol. 2, p. 45. London, 1949. Hogarth Press.
10. Bell, A. I. and Levine, M. I. Psychologic aspects of pediatric practice. *Pediatrics*, 14: 259, 1954.
11. Huschka, M. Child's response to coercive bowel training. *Psychosomatic Med.*, 4: 301, 1942.
12. Daniels, G. E. Psychiatric factors in ulcerative colitis. *Gastroenterology*, 10: 59, 1948.
13. Sullivan, A. J. Psychogenic factors in ulcerative colitis. *Am. J. Digest. Dis. & Nutrition*, 2: 651, 1936.

DISCUSSION

Harrison Sadler (Detroit, Mich.): You people are so specific and definite about your proposals that I am a bit frightened.

It is a great pleasure and a privilege to speak to this Society. I wish more of our medical specialist groups would devote a portion of their program to the exchange of ideas concerning the entrance into human behavior of particular organ systems. I cannot thank Dr. Alexander for his curiosity; that is part of his nature. I do praise his use of it. I can hope that he will keep it alive and will extend part of it to the medical profession at large.

Dr. Alexander has done a magnificent job, probably greater than is realized. First, he has asked us to consider the lower intestine as a level for the expression of emotion in the human being and as a participant in the function of its behavior. He has collected empiric data from his own experience to illustrate this. Second, he has reached out to the scientific discipline of psychoanalysis for data to help him formulate and understand his clinical observations. He has done this in a respectful way. The data which he found seem to have helped him.

I have no disagreement with any of the material presented. I ask each of you to be sensitized by it. The intestine, and especially its lower anorectal connections with the outside, arose phylogenetically as one of the adaptive functions of the living organism evolving itself toward higher forms. Its primitive function was purely eliminative. It performed this passively and autonomously.

With the growing complexity of the evolving organism there arose connections with a central nervous system, and this formerly autonomous organ unit became part of the integrated pattern of behavior of the organism. Its control became a function of the central nervous system and the animal could now control the movement of its bowels.

Later, with the origin of the mental apparatus and the dawn of consciousness, and later the ability to think, abstract and symbolize, this anorectal region could become invested with meaning and its function become a part of the character of the individual. Its control aspects were now the intention of the culture of the particular society of the human being, and the fears, demands and wishes of his particular parents.

The function of this particular organ system, because of its external connection and its use for the elimination of waste, is "educated," and the infant at eighteen months to two and a half years is exposed at a very early age to the values, conflicts, morals, etc., of his people.

The precipitates of this early struggle form part of the building blocks of the child's later personality and character. These character problems, and the organism's symbolic use of this region, are manifold in the tough clinical problems to be handled in daily practice. These have been beautifully illustrated by Dr. Alexander.

I should like to leave for consideration a broad and general theoretic statement. Whenever an organ system participates in the behavior of a person and thus becomes invested with psychic energy, it follows that the removal of that organ system surgically, or the cure of its illness medically, releases this bound energy. This energy must then be dealt with by the mental apparatus. New symptoms of a different nature, often mental, may appear. It behooves us to study our patients carefully before proceeding heroically with any manipulations in this important area.

Future medical education will include such theoretic presentations and considerations in its curriculum in anatomy, physiology, pathology and the clinical fields. We are already doing this at Wayne University.

Robert Foster (Topeka, Kan.): I have one reaction to Dr. Alexander's paper, which I have had to many papers given by psychiatrists and others, and that is, most of the problems laid to the children are put on the mother.

I merely want to point out the fact that we see more men than women. The American father is a kind of neglected animal. I believe that fathers are afraid of their sons and daughters growing up through adolescence. The fact that American fathers do not have time for their children, the fact that they reject them in many respects, and the fact that they act like kind of a policeman for mother, make it seem to me that one of the important areas for consideration is the role of the father in relation to many of these psychiatric and emotional problems, as well as the role of the mother in the whole family situation.

Richard M. Alexander (closing): I did not mean to neglect the father in consideration of this very important subject. Certainly the father is important, but not nearly as important as the mother. It has been proved psychoanalytically that in the development of bowel habit training and the formation of ulcerative colitis, the mother or some female relative is usually the predominant person involved.

Non-specific Ulcerative Colitis, with Reference to Mortality, Morbidity, Complications and Long-Term Survivals Following Colectomy

HARRY E. BACON, M.D., LIN MIN OUYANG, M.D., PAUL T. CARROLL, M.D., BRUCE A. CATES, M.D., GUILLERMO VILLALBA, M.D. AND ROBERT A. MCGREGOR, M.D., *Philadelphia, Pennsylvania*

THE literature is replete with reference to non-specific ulcerative colitis in its varied phases, although reports are sparse regarding long-term survivals following resection.

Our experience, covering the fifteen and a half-year period from September 1940 to March 1956, includes 402 patients with non-specific ulcerative colitis. Of this number, eighty-four, or 20.8 per cent, submitted to total or subtotal colectomy. (Table I.)

TABLE I

NON-SPECIFIC ULCERATIVE COLITIS

No. of patients	402
No. of patients resected	84 or 20.8%

In the mid-forties, it was our custom to employ the three-stage operation, that is, ileostomy, total colectomy, and finally, abdominoperineal excision.[20] Later we found it more favorable to employ the two-stage procedure, consisting of ileostomy and colectomy at the first stage, and abdominoperineal excision at the second stage.[21–23] In 1952, we began the one-stage operation, consisting of terminal ileectomy with permanent ileostomy, total colectomy and proctectomy in a single procedure.[24]

Resection has been performed upon eighty-four patients, as shown in Table II.

While it is not our purpose to discuss ileostomy alone, we wish to go on record as stating that we do not favor performing this operation except in the most unusual circumstances. During the past few years, we have performed "single" ileostomy in only four instances. In three, the patients were suffering an acute fulminating exacerbation of their disease; resection was carried out later. The fourth was a young girl, in whom we established an ileostomy at the insistence of her parents to teach her how to manage it. Colectomy was performed three months later. On the other hand, we are equally unsympathetic to those who contend that "no patient is so ill that he cannot undergo total colectomy and proctectomy as a single stage maneuver.[11]

TABLE II

Group	No. of Stages	Technic	No. of Cases
A	One-stage	(1) Ileostomy, total colectomy and proctectomy	28
B	Two-stage	(1) Ileostomy and colectomy, (2) abdominoperineal excision	28
C	Three-stage	(1) Ileostomy, (2) colectomy, (3) abdominoperineal excision	9
D	One-stage	(1) Total or subtotal colectomy with ileotransversostomy or ileosigmoidostomy	15
E	One-stage	(1) Left hemicolectomy and proctectomy	4

Pathologic Aspects of Resected Specimens. Pseudopolyposis: This is a rather constant finding in ulcerative colitis, although statistics vary markedly, due largely to the source of the material studied. In our group of eighty-four patients on whom colectomies were performed there were forty-eight with pseudopolyposis, an incidence of 57.1 per cent. Also, there were nine cases with superimposed malignancy, an incidence of 18.7 per cent of those patients having pseudopolyposis.

Cancer: Of the eighty-four patients who underwent colectomy twelve showed evidence of cancer in the resected specimen. In Case 10

TABLE III

ULCERATIVE COLITIS WITH CANCER SUPERIMPOSED

Case No. and Initials	Age and Sex	Location of Cancer	Type of Cancer	Nodal Involvement	Pseudo-polyposis Associated	Duration of Symptoms	Length of Survival Following Resection	Present Status As of January, 1956	Stages
1., W. E.	38, M	Rectum	Adenocarcinoma	No	Yes	22 yr.	Living and well 4 yr.	Living and well free of recurrence	1
2., S. St. J.	45, F	Descending colon	Adenocarcinoma	Yes	No	18 yr.	Lived 18 mo.	Dead	2
3., W. B.	24, M	Rectosigmoid	Adenocarcinoma (grade 2)	Yes	Yes	5 yr.	Lived 25 mo.	Dead	2
4., M. L.	32, F	Rectum	Marked anaplasia, adenocarcinoma (grade 2)	No	Yes	5 yr.	Lived 3 yr.	Dead	1
5., C. N.	31, M	Descending colon	Adenocarcinoma	Yes	Yes	10 yr.	18 mo.	Dead	1
6., P. S.	46, F	Transverse colon	Adenocarcinoma	No	Yes	10 yr.	1 yr.	Dead	1
7., J. S.	34, F	Rectosigmoid	Adenocarcinoma	Yes	Yes	6 yr.	1 yr., died of brain metastasis	Dead	1
8., Z. B.	32, F	Appendix	Carcinoid	No	No	18 mo.	13 mo., operated upon June, 1954	Living and well, free of recurrence	1
9., M. N.	43, F	Rectum	Adenocarcinoma	No	Yes	7 mo.	2½ yr.	Living and well, free of recurrence	1
10., V. A.	47, F	Sigmoid (1954), breast (1955)	Adenocarcinoma	No	Yes	8 yr.	2 yr.	Living and well	2
11., E. K.	25, M	Rectum	Adenocarcinoma	?	No	6 yr.	5 yr.	Dead	2
12., A. N.	40, M	Cecum	Adenocarcinoma	No	Yes	13 yr.	3 yr.	Living and well	1

(Table III) a right subtotal colectomy was carried out for ulcerative colitis. This patient had undergone resection for carcinoma of the sigmoid in 1954. In 1955 radical mastectomy was performed. Case 11 (Table III) had undergone ileostomy and colectomy in 1949, but did not return for the second (abdominoperineal) stage. It is known that he was operated upon elsewhere in 1954 for cancer of the rectum and declared inoperable because of advanced metastasis to the liver. Thus in twelve of the eighty-four patients cancer of the bowel developed, an incidence of 14.3 per cent. However, forty-one of the eighty-four patients described symptoms for five years or longer; in this group there were twelve cases of cancer, an incidence of 29.2 per cent.

Involvement of Ileum. It is the general consensus that involvement of the ileum represents a "backwash" or retrograde extension into the terminal ileum through the ileocecal valve. In our series of patients on whom colectomies were performed (excluding the four in whom a left hemicolectomy was performed), there were thirty-five cases or 43.7 per cent. This finding is of significance to those who, at the time of resection, are most careful to inspect the ileum and to obtain frozen sections from the

site of the divided ileum, as recommended by Dennis.[3]

Involvement of Jejunum. In rare instances ulcerative colitis may extend cephalad to reach the jejunum. McCready[4] reported four cases of simultaneous involvement of the ileum and jejunum with multiple, well defined ulcers. Thorek[5] also cited a case. Others may have observed similar invasion, although we have not found it recorded in the literature. In our group of patients, excluding the four in whom left hemicolectomy was performed, there were four in whom jejunal involvement was demonstrated (5.0 per cent). (Table IV.) In one patient (Case 2) 240 cm. (96 inches) of ileum and jejunum were included in the operative specimen.

TABLE IV
PATIENTS WITH EVIDENCE OF JEJUNAL INVASION

Case No. and Initials	Year	Age and Sex	Duration of Symptoms (yr.)	Involvement Determined by Gross Appearance or Microscopy	Status
1., L. E.	1947	9, F	1	Both	Dead
2., C. S.	1953	39, F	1	Gross appearance	Dead
3., H. D.	1955	24, M	2½	Both	Living and well
4., W. R.	1956	29, M	3	Both	Dead

Anorectal Pathology. This subject has been detailed in an excellent report by Jackman.[6] In our series of patients under consideration there were many instances of pseudopolyps, stricture, abscess, fistula, fissure and stenosis. There were forty-eight patients who had evidence of pseudopolyposis, and of this number thirty-one or 64.5 per cent were found on rectal examination. In thirty-eight instances of the total series (45.2 per cent) an abscess or fistula had developed at some time during the course of the disease. Of significance is the fact that twenty-three of the thirty-eight patients or 60.5 per cent had undergone forty-six operations elsewhere for attempted correction with or without apparent recognition of the etiology. Nine had had one operation, eight had had two, four had had three, one had had four, and one had had five operations. Anal fissure was or had been present in four; there was stenosis in three and incontinence in five.

Of the eighty-four patients there were thirteen or 15.4 per cent with inflammatory stricture, in eleven of which the lesion was located in the rectum or at the rectosigmoid. Four were multiple.

Mortality from Colectomy. In the eighty-four patients undergoing colectomy there were two postoperative deaths. In these eighty-four patients there was a total of 129 resections, as required with the one-, two- and three-stage operation, but with no additional mortality. Thus the patient mortality is calculated as

TABLE V
MORTALITY FROM COLECTOMY

Group	No. of Stages	Procedure	No. of Patients Resected	Total No. of Resections Performed	Deaths	Patient Mortality (%)	Colectomy Mortality (%)
A	1	Ileostomy, total colectomy and proctectomy	28	28	1	3.5	3.5
B	2	Ileostomy and colectomy	..	28	..	...	...
		Abdominoperineal excision	28	25*	1	3.5	1.8
C	3	Ileostomy	..	...	..	...	...
		Total colectomy	9	9	0	0	0
		Abdominoperineal excision	..	9	..	...	...
D	1	Partial colectomy with ileotransversostomy or ileosigmoidostomy with total colectomy	15	17†	0	0	0
E	1	Left hemicolectomy and proctectomy	4	4	0	0	0
Totals	..	.....	84	120	2	2.3	1.6

* Two patients did not return for abdominoperineal excision.
† Two patients required stage procedures.

2.3 per cent and the colectomy mortality as 1.6 per cent. (Table v.)

Complications and Sequelae Incident to Colectomy. It can be stated without equivocation that the large number of complications that developed after simple ileostomy was the source of extreme discouragement to the conscientious and humanitarian impulses, too often filling us with despair and a sense of dismal failure. It is not so long ago that the writer endured mental anguish and the inner turmoil of frustration each time a patient was readmitted suffering from physiologic imbalance, apparent obstruction and the complications incident to the ileostomy. Only a surgeon can appreciate his own melancholic inadequacy and the shock of witnessing the death of a young person who came to this unfortunate end, as a result of one's well-meaning efforts to preserve life.

By comparison, the complications incident to *ileostomy with total colectomy*, and proctectomy in one or more stages, have been relatively few. Those requiring surgical intervention are listed in Table vi. It will be noted that fifty additional operations were required, with three deaths, a mortality of 6.0 per cent. Two known deaths occurred following discharge of the patients from the hospital, as shown in last column. It is gratifying to reflect that during the year of 1955 and in the first few months of 1956 only four patients were readmitted for additional operation: two for curettage of perineal sinus, one for lysis of adhesions and one for revision of the ileostomy.

The cause of death in patients in whom complications developed is shown in Table vii; group i, those who required surgical intervention; group ii, those in whom surgery was not instituted; and group iii, those who died of associated cancer of the bowel.

Period of Hospitalization. In years past it was our practice to confine the patient to the hospital until he or she became accustomed to the ileostomy, and particularly to keep the patient under observation should complications arise. A minimum period of twenty-one days was stipulated. During the past year, however, since employing the Brooke-Valiente technic in the performance of ileostomy, total colectomy and proctectomy in one stage, the results have been so favorable that patients are discharged approximately ten to fourteen days following colectomy. Ordinarily the temporary (Mason) bag is fitted to the ileostomy on the second postoperative day and the permanent (Henry) bag on the eighth day, so that the patient is discharged shortly thereafter. Of the twenty-eight patients who had undergone a one-stage ileostomy, total colectomy and proctectomy at one time (Group A) between 1952 and 1955 (Table viii), the shortest period from the date of colectomy to discharge was eleven days and the longest sixty-seven days, an average of 23.3 days. The latter was the patient cited in Table iv (Case 2), with an involvement of the jejunum, in which 240 cm. of ileum and jejunum were included in the operative specimen.

As would be expected, the aggregate number of hospital days for the two- and three-stage operation (groups B and C), is proportionately greater. It will be noted, however, that with subtotal colectomy (group D), embodying resection and anastomosis without the establishment of an ileostomy, the number is mate-

TABLE VI

COMPLICATIONS AND SEQUELAE INCIDENT TO COLECTOMY, REQUIRING ADDITIONAL SURGERY

Complications	No. of Operations	No. of Deaths in Hospital	Known No. of Deaths Following Early Discharge from Hospital
Revision ileostomy for:			
Fistula:			
Above skin level	4	0	0
At skin level	5	0	0
Below skin level but above parietal peritoneum	2	0	0
Below skin level (Case 1)	2	0	1(50%)
Prolapse of ileum	3	0	0
Stenosis of ileum	4	0	0
Retraction of stoma	3	0	0
Extension of disease (partial ileectomy)	2	0	0
Obstruction of small bowel (Cases 3, 4 and 5)	9	3(33⅓%)	0
Partial resection of jejunum (Case 2) and closure ileal fistula	1	0	1(100%)
Closure jejunal fistula	1	0	0
Subdiaphragmatic abscess	3	0	0
Abdominal wound abscess	3	0	0
Perineal wound curettage	4	0	0
Resection for carcinoma of sigmoid subsequent to subtotal colectomy	1	0	0
Reresection for recurrent carcinoma	1	0	0
Repair:			
Dehiscence	1	0	0
Incisional hernia	1	0	0
Total	50	3(6.0%)	2(4%)

TABLE VII

CAUSE OF DEATH (FOLLOWING SURGICAL OR NON-SURGICAL MANAGEMENT OF COMPLICATIONS IN HOSPITAL OR AFTER DISCHARGE)

Case No. and Initials	Cause of Death	Interval between Colectomy and Death	Interval between Additional Surgery and Death	Autopsy
		Group I: Surgical		
1., P. H.	Pulmonary infarction	4 mo.	3 mo.	No
2., C. S.	Cardiac dilatation	4 mo.	6 wk.	No
3., B. L.	Coronary thrombosis	2 mo.	7 days after laparotomy for intestinal obstruction	No
4., J. DiR.	Peripheral vascular failure	7 yr.	8 days following lysis of adhesions for intestinal obstruction	No
5., H. K.	Peripheral vascular collapse	7 mo.	7 weeks following lysis of adhesions for intestinal obstruction	No
		Group II: Non-surgical		
1., L. E.	Peripheral circulatory collapse	10 mo.	6 mo. following revision of ileostomy	Yes
2., E. G.	Peripheral circulatory collapse, diabetes, tuberculosis, cirrhosis	1 mo.	None performed	Yes
		*Group III: Patients with Cancer of Bowel**		
1., M. L.	Carcinomatosis	3 yr.	.....	Yes
2., P. S.	Carcinomatosis	1 yr.	.....	No
3., W. B.	Carcinomatosis	25 mo.	.....	No
4., S. St. J.	Carcinomatosis	18 mo.	.....	No
5., J. S.	Carcinomatosis with metastasis to brain	1 yr.	.....	Yes
6., C. N.	Carcinomatosis	18 mo.	.....	No
7., E. K.	Carcinomatosis	5 yr.	.....	?

* See also Table III.

rially lower, namely, fifteen and three-fourths days.

Pregnancy Following Total Colectomy and Proctectomy with Ileostomy. There are available several very excellent and rather exhaustive reports[7–12] concerning pregnancy with ulcerative colitis and vice versa, but there is little to be found regarding normal gestation in patients who have undergone colectomy and proctectomy. Successful cesarean section has been recorded by McKittrick and Moore,[13] and by Hull and Magee.[14] However, the question arises, Why should not the normal route of delivery be employed? It has never occurred to us to advocate cesarean section following an abdominoperineal excision of the Miles or "pull through" type for cancer, which one might consider an analogous operative situation except for the ileostomy which is incidental. Among our patients we have had three pregnant women of ten, twelve and sixteen weeks' gestation, respectively, in whom the pregnancy was complicated by malignancy of the rectum. An abdominoperineal proctosigmoidectomy was performed in two (one of which was reported by Rowe and Bacon[15]), and in the third an abdominoperineal excision with panhysterectomy was instituted recently. In three other patients a pull through procedure was carried out two, three and nine months following delivery.[16] No complications were encountered in any of these patients and all are living, one eight and another nine and a half years after resection. One of the children was stillborn, one was aborted three days after the patients' discharge from the hospital, one was removed with the hysterectomy and three are living and well. Six of our patients with ulcerative colitis

TABLE VIII

PERIOD OF HOSPITALIZATION FOLLOWING VARIOUS TYPES OF COLECTOMY*

Group	Type	No. of Patients	No. of Stages	Average No. of Days from Date of Colectomy to Date of Hospital Discharge	Patient Mortality from Colectomy Irrespective of Stages
A	One-stage	28	1	23.3	1
B	Two-stage	28	2	44⅓	1
C	Three-stage	9	3	82½	0
D	Subtotal	15	1	15¾	0
E	Left hemicolectomy	4	1	21½	0

* Patients with cancer included; patients readmitted for additional surgery (such as revision of ileostomy, or obstruction) not included.

TABLE IX

ULCERATIVE COLITIS

Patients Who Became Pregnant Following Ileostomy, Total Colectomy and Proctectomy (Ileostomy, Total Colectomy and Proctectomy in One, Two or Three Stages; Resection with Anastomosis Excluded)

Case No. and Initials	Age	No. of Stages	Types of Operation	Date of Delivery	Type of Delivery	Status of Child	Weight at Birth
1., R. L.	22	3	Ileostomy (1947); colectomy (1948); abdomio-perineal excision (1948)	1950	Vaginal route	Living and normal	6 lb., 2 oz.
2., G. K.	24	2	Ileostomy and colectomy (1950); abdomino-perineal excision (1950)	1953	Vaginal route	Living and normal	7 lb., 8 oz.
3., E. H.	21	2	Ileostomy and colectomy (1950); abdomino-perineal excision (1951)	1955	Vaginal route	Living and normal	5 lb., 1 oz.
4., H. S.	30	2	Ileostomy and colectomy (1949); abdomino-perineal excision (1950)	1951	Vaginal route	Living and normal	6 lb., 12 oz.
5., C. S.	29	3	Ileostomy (1950); colectomy (1951); abdomi-noperineal excision (1952)	1953	Vaginal route	Living and normal	7 lb., 4 oz.
6., E. B.	28	1	Ileostomy, colectomy and proctectomy (1954)	1954	Vaginal route	Living and normal	7 lb., 8 oz.

became pregnant following ileostomy, total colectomy and proctectomy. Each was delivered by the normal route, and in each instance the child is living and well. (Table IX.)

Long-term Survival and Rehabilitation. A subtotal or total colectomy in which resection and anastomosis is performed carries with it but minimal risk, and the inconvenience and expense entailed thereby is a small price to pay for health.

Total colectomy with proctectomy, on the other hand, requires permanent ileostomy, and this in turn condemns the patient to the wearing of a "bag contraption" for the remainder

TABLE X

Type As to Stages	No. of Patients Undergoing Colectomy*	No. Excluding Those Who Died of Cancer	Status 2nd Year Following Colectomy		Status 3rd Year Following Colectomy		Status 5th Year Following Colectomy		Status 7th Year Following Colectomy		Status 8th Year Following Colectomy		Status 9th Year Following Colectomy	
			Living (%)	Rehabilitated (%)	Living (%)	Rehabilitated (%)	Living (%)	Rehabilitated (%)	Living (%)	Rehabilitated (%)	Living (%)	Rehabilitated (%)	Living (%)	Rehabilitated (%)
Three-stage.....	9	9	100	100	100	100	100	100	100	100	100	100	100	100
Two-stage.....	28	25	95.4	86.3	100	95.2	100	91.2	83.3	66.6	100	50	100	100
One-stage (total) complete.....	28	27	100	100	100	100	.....	.....	.....	.....	.....	.....	.....	.....
One-stage (subtotal or total).....	15	13	100	100	100	100	100	100	100	100	100	100	100	100
One-stage (hemicolectomy).....	4	3	100	100	100	100	100	100	.....	.....	.....	.....	.....	.....
Totals.....	84	77	(69) 98.5%	(68) 97.1%	(47) 100%	(46) 97.8%	(28) 100%	(27) 96.4%	(18) 94.7%	(17) 89.4%	(13) 100%	(12) 92.3%	(8) 100%	(8) 100%

* Two colectomy deaths deleted.

of his life. This situation poses a problem indeed—a problem which we as surgeons are called upon to face frequently. The psychiatrists, psychoanalysts, psychologists and other proponents of the arts of psyche would have us believe that ileostomy is not only unnecessary but also actually constitutes a sacrilege or even an invasion of the patient's rights and privileges under the Constitution. It is no secret that intelligence is a rare commodity, but there should be enough passed around among these practitioners to qualify them to distinguish between organic disease and a functional process, between irreversibility and reversibility. It is not the purpose of this report to comment upon the very excellent investigative work being done for the mentally ill patient, but the proper place for the organically or psychically ill patient should not be overlooked. So eminent an authority as Leland McKittrick has stated, "Any time anyone transfers the responsibility for a seriously ill patient to a psychiatrist, he may be signing the death warrant of that patient." The first consideration is the patient. He, and the referring physician who has an obligation to that patient, have a right to inquire what can be expected as to life expectancy and rehabilitation. In the case of an ileostomy what are the prospects of survival? More, what are the chances for a rehabilitated life? It should never be a question of whether or not the surgeon can successfully perform such a formidable procedure, but rather can and will the patient be able to return to his former work, rear a family, lead an active life within the limits of his ability and serve his community as a useful citizen?

In an attempt to answer these questions, we reviewed the records of our eighty-four patients on whom colectomies were performed. The series is not large and many of the cases are too recent to be considered. It may appear ironic that these patients have been extremely cooperative, returning periodically for examination through the years. By and large, they represent the solid stock of American life, working and rearing a family. Perhaps at times they reflect upon their hospitalization before and after operation, the nasal suction, the catheter drainage, the stuffy dressing in the perineal wound, the numerous venipunctures incident to blood surveys and the prolonged parenteral feeding, to say nothing of the ileostomy itself. Nevertheless, they make clear their appreciation of what has been achieved in their behalf and it is extremely gratifying to find these efforts rewarded in the complete data these patients, by their cooperation, make available.

As previously stated, one death occurred the day following operation for intestinal obstruction which developed seven days following total colectomy. The second death occurred following the first stage of the colectomy. As in all biometric surveys, in determining the five- and ten-year cancer survival,[17,18] it is customary to delete the deaths from resection. Thus with the two deaths deleted, eighty-two patients remain who survived colectomy. Of

this number, twelve or 14.3 per cent showed evidence of cancer of the bowel. The seven who died of cancer are not included, as shown in Table x, while the four who are living and well, together with the one patient with carcinoid of the appendix which was removed as an integral part of the total colectomy, are included in the calculations. It may be mentioned that all twelve patients with cancer superimposed underwent resection without a fatality.

A perusal of Table x shows that five patients died during the immediate twelve-month period following their colectomy, a child aged nine during the second year and one patient during the seventh year. One patient is alive in the eighth year following colectomy but has not been able to return to his work because of an intercommunicating fistula of the small bowel. Severe cervicothoracic arthritis is a contributing factor in his disability.

The incidence of rehabilitation is computed as 97.1 per cent two years after colectomy; 97.8 per cent three years after colectomy; 96.4 per cent for five years after colectomy; 89.4 per cent seven years after colectomy; 92.3 per cent eight years after colectomy and 100 per cent nine years after colectomy.

SUMMARY

A series of eighty-four patients on whom colectomies were performed is reported, with particular reference to the pathologic findings, mortality and morbidity, rates of survival and percentage of rehabilitation.

REFERENCES

1. Ripstein, C. B., Miller, G. G. and Gardner, C. M. Results of surgical treatment of ulcerative colitis. *Ann. Surg.*, 135: 14, 1952.
2. Miller, G. G. and Ripstein, C. B. Surgical management of ulcerative colitis. *Surg., Gynec. & Obst.*, 88: 351, 1949.
3. Dennis, C. Ileostomy and colostomy in ulcerative colitis. *Surgery*, 18: 435, 1945.
4. McCready, F. J., Bargen, M. B. and Waugh, J. M. Involvement of the ileum in chronic ulcerative colitis. *New England M. J.*, 240: 119, 1949.
5. Thorek, P. Personal communication.
6. Jackman, R. J. Management of anorectal complications of chronic ulcerative colitis. *Arch. Int. Med.*, 94: 420, 1954.
7. Kleckner, M. S., Bargen, J. A. and Banner, E. A. Association of ulcerative colitis and pregnancy. *Proc. Staff Meet., Mayo Clin.*, 27: 189, 1952.
8. Kellett, H. I. The influence of pregnancy on chronic ulcerative colitis. *Tr. Am. Proct. Soc.*, p. 574, 1952.
9. Foster, O. C. and Cohen, E. S. Effects of pregnancy on ulcerative colitis. *J. Int. Coll. Surgeons*, 19: 763, 1953.
10. Abramson, D., Jankelson, I. R. and Milner, L. R. Pregnancy in idiopathic ulcerative colitis. *Am. J. Obst. & Gynec.*, 61: 121, 1951.
11. Felsen, J. and Walarsky, W. Chronic ulcerative colitis and pregnancy. *Am. J. Obst. & Gynec.*, 56: 751, 1948.
12. Marks, M. M. and Thiels, G. H. Management of proctologic disease in pregnant and parous women. *Am. J. Surg.*, 90: 826, 1955.
13. McKittrick, L. S. and Moore, F. D. Ulcerative colitis. *J. A. M. A.*, 139: 201, 1949.
14. Hull, L. E. and Magee, R. B. Pregnancy after total colectomy for ulcerative colitis. *Pennsylvania State M. J.*, 38: 586, 1955.
15. Bacon, H. E. and Rowe, R. J. Abdominoperineal proctosigmoidectomy for rectal cancer complicating pregnancy. *South. M. J.*, 40: 471, 1947.
16. Bacon, H. E. Cancer of the rectum; five and ten year survival, following the "pull-through" operation with sphincter preservation. *J. A. M. A.*, 160: 628, 1956.
17. Hill, A. B. Principles of Medical Statistics. London, 1950. Lancet Ltd.
18. Newman, G. Great Britain Ministry of Health Report. London, 1927.
19. McKittrick, L. S. Discussion of symposium on chronic ulcerative colitis. *Tr. Am. Proct. Soc.*, p. 625, 1953.
20. Bacon, H. E. and Vaughan, G. D. Surgical management of lesions of the large bowel. *Am. J. Surg.*, 76: 648, 1948.
21. Bacon, H. E. and Trimpi, H. D. Intractable ulcerative colitis and its surgical treatment. *West. J. Surg.*, 61: 688, 1953.
22. Bacon, H. E. and Trimpi, H. D. Selection of an operative procedure for patients with medically intractable ulcerative colitis. *Surg., Gynec. & Obst.*, 91: 409, 1950.
23. Bacon, H. E. and Trimpi, H. D. Surgical management of ulcerative colitis. *J. A. M. A.*, 153: 1249, 1953.
24. Bacon, H. E. Nonspecific ulcerative colitis. In process of publication.

One-Stage Total Colectomy for Ulcerative Colitis

LAURENCE S. FALLIS, M.D., *Detroit, Michigan*

From Henry Ford Hospital, Detroit, Michigan.

THE thinking regarding the surgical treatment of ulcerative colitis has now crystallized into the concept that when operation is indicated a permament ileostomy should be fashioned and the entire colon and rectum should be removed.[1] There is now adequate statistical evidence to confirm the validity of the proposal that the one-stage operation is the procedure of choice.[2] This paper deals with the one-stage removal of the colon and rectum through an abdominal incision, or to state it otherwise, the entire rectum and anal canal are removed by anterior resection. Utilization of the abdominal approach eliminates the perineal portion of the operation and obviates the necessity of moving the patient during the performance of the terminal phase of the procedure. In this manner the fall in blood pressure and onset of shock which sometimes follow changing the position of the patient is avoided. This objection, although not as common as it was formerly, is still of some importance when dealing with these depleted patients, all of whom are not ideal operative risks for a procedure of the magnitude of the one-stage operation. At the same time a note of warning should be sounded, for all patients are not suitable for the one-stage operation and considerable care must be exercised in the selection. Inasmuch as a properly functioning ileostomy is the most important part of the operation, it is often advisable in depleted patients to perform the ileostomy as the first stage of a two-stage operation. In this way the metabolic and chemical changes incidental to the formation of the ileostomy are taken care of and all the necessary adjustments have been made before proceeding with the major portion of the procedure.

Selection of Patients for Operation. There are two main indications for operative intervention in ulcerative colitis: (1) those patients in whom complications of the disease have developed, and (2) those who are not responding satisfactorily to medical treatment or are unable to maintain health under a medical regimen.

Preparation of the Patient for Operation. Sufficient time can usually be taken to accomplish this objective, except in those emergency cases of hemorrhage, perforation and rarely in fulminating cases when the performance of the emergency ileostomy may be a life-saving measure. All patients present a serious nutritional problem. It has been our experience that improvement of the nutritional status produces stabilization of the patient and that adjustment of the metabolic and chemical imbalance occurs automatically. We have reached this objective by forced tube feeding with liquefied natural foods.[3] In this manner we have been able to give the patient from 5,000 to 8,000 calories in twenty-four hours. Homogenization of natural food has enabled us to build up the caloric content without accruing any of the difficulties inherent in synthetic formula administration. The patient's general condition rapidly improves with tube feeding, the diarrhea decreases and a general feeling of well-being is promoted. Above all, the desire to live returns. In some patients the deficient situation may be regulated in as short a period as ten days, while in others a month will be required. Blood deficiencies are corrected as indicated. The bacterial content of the intestinal tract is diminished by administration of sulfonamide. A Miller-Abbott tube is passed before operation.

Anesthesia. Spinal anesthesia provides the maximum relaxation that is so essential to

permit mobilization of the colon with minimal handling of the bowel.

Ileostomy Site. Ileostomy bags of the Rutzen type are best adapted to the abdominal wall when the ileostomy opening is made at a point midway between the umbilicus and the anterosuperior spine of the ilium. A circular area of skin, 1 inch in diameter, is removed at this point of election and a similar area of the anterior rectus sheath is detached. This is conveniently done before the main incision is made.

Incision. A long left pararectal incision, extending from the pubic crest to just below the costal margin, with reflection of the rectus muscle outward before opening the posterior rectus sheath, provides satisfactory exposure and is inducive to firm healing of the postoperative wound.

Technic. It is extremely important to minimize handling and palpation of the colon. The first step is to explore the abdominal cavity to make certain that malignant degeneration has not developed in any part of the colon and that the terminal ileum is free of disease. The liver also should be inspected since gross evidence of liver involvement might make it advisable to proceed with a staged procedure. If there has been no previous abdominal surgery and the omentum is of good texture, we have found it expedient to save the omentum since it acts as an excellent protection to the small intestine after colectomy. The omentum is separated from the colon by dissection along the avascular plane which is its only attachment. The stomach with the attached great omentum is then pushed up out of the operative field. If the omentum is to be sacrificed, the gastrocolic omentum is sectioned, avoiding injury to the gastroepiploic vessels. The right colon is most easily and effectively mobilized by freeing the hepatic flexure first and then working down toward the ileocecal junction. In this fashion more of the peritoneum is left to provide for future covering of the posterior abdominal wall than when the mobilization is begun at the ileocecal junction. Since there is usually foreshortening of the mesentery of the colon, the splenic flexure is easier to mobilize than when dealing with carcinoma of the bowel. However, it will be facilitated by starting the freeing of the bowel below the splenic flexure and working upward. It is of distinct advantage to preserve as much peritoneum of the mesosigmoid as is possible in order to facilitate the formation of the new pelvic floor. The left ureter is identified and protected as the lateral leaf of the mesentery is dissected. The superior hemorrhoidal artery is picked up and ligated at the promontory of the sacrum, and the rectum and mesorectum are freed from the hollow of the sacrum by blunt finger dissection. If this maneuver is carried out before the anterior peritoneal incision is made, it will be possible to preserve a larger amount of peritoneum than if the classic reverse method is used. This extra peritoneum will be found useful when the new peritoneal floor is re-formed.

Anteriorly, the peritoneum is cut across at the most dependent point of the rectovesical or rectovaginal pouch and the rectum is separated from the bladder and prostate in the male and from the uterus and vagina in the female. The dissection is then carried down to the upper surface of the levator ani group of muscles and detachment must be continued until the levators are well defined. In the male it is necessary to incise the superior rectourethralis muscle at the tip of the prostate. The urethra is protected by the previous insertion of an indwelling No. 15 French urethral catheter. The lateral rectal stalks are now identified. The middle hemorrhoidal vessels usually require ligation since in inflammatory lesions of the bowel these vessels are larger than those found when dealing with carcinoma. The posterior triangular ileorectococcygeus muscle attaches the first part of the rectum to the tip of the coccyx. Section of this muscle in a transverse direction will free the backward curve of the rectum so that it can be straightened out when upward traction is applied. The main arterial vessels supplying the colon are sectioned and the bowel is removed close to the mesentery to preserve as much peritoneum as possible. The right ureter and duodenum are protected as the right colon is separated from its mesentery. The entire colon and rectum is now freed down to the level of the levator ani muscles. A hernia tape is tied around the rectum just above the insertion of the levator ani muscles in order to minimize soiling of the anal canal and perianal tissues. The lower rectum is dissected free from the levator ani muscles using long, curved, dissecting scissors. This dissection is continued down until the levators are entirely freed. The appearance of

the ischiorectal fat indicates that the detachment has been completed. Upward traction on the rectum greatly facilitates this maneuver. Maintaining traction on the rectum and proceding with the dissection close to the anal canal will enable the surgeon to continue the separation down through the attachment of the external sphincter group of muscles. Four or five Michel clips inserted at the mucocutaneous junction before the operation begins will act as a landmark and aid in determining the point of section of the skin. The perianal skin is cut across at right angles to the long axis of the bowel, thereby completing the mobilization of the rectum and anal canal. The terminal ileum is sectioned between clamps and the entire structure is removed.

In an earlier series[4] the muscularis and the submucosa of the rectum were cut across at the level of the superior surface of the levator ani muscles and the mucosa was sectioned at a lower level. This left a cuff of mucous membrane which had to be removed from the perineum after the abdominal incision was closed. Increasing experience with the procedure has resulted in an extension of the operation which always includes the anal mucous membrane and the perianal skin. The only real difficulty encountered will be in those cases in which there has been perianal infection involving the ischiorectal fossa with abscess and fistula formation. In this event the dissection of the anal canal often is tedious and time consuming.

The terminal ileum is now pulled through the previously prepared opening in the abdominal wall and the mesentery of the intra-abdominal portion sutured to the peritoneum of the lateral abdominal wall. At least 4 inches of ileum should protrude above the surface of the abdominal wall. A circular incision is made through the serosa and muscularis of the extruded ileum at a point 2 inches from the skin margin. The distal 2 inches of the ileum is then everted on itself and the mucosa is sutured to the skin margin with interrupted sutures of fine silk, as suggested by Brooke[5] and emphasized by Turnbull.[6] It is important to make an accurate closure of these structures to prevent the formation of granulation tissue and avoid subsequent scar formation. The peritoneal floor is now reformed; since ample peritoneal flaps have been fashioned, a very satisfactory loose closure is easily made. The abdominal wound is closed in layers. The operation is completed by the insertion of Penrose drains in the anal orifice to drain the area.

COMMENTS

Elimination of the perineal portion of the operation avoids the change in position of the patient which is often conducive to lowering of blood pressure and the onset of shock. Furthermore, there is less blood loss since there is only minimal perineal dissection. The resulting perineal wound heals promptly, thus eliminating the long delay usually associated with perineal resection. This technic has been performed on twenty-nine patients (sixteen one-stage operations and thirteen two-stage operations). There were no immediate postoperative deaths in the series, but one patient died on the twenty-third postoperative day following a secondary operation for intestinal obstruction due to volvulus.

CONCLUSIONS

One-stage removal of the entire colon, rectum and anal canal through an abdominal incision is a feasible operative procedure in selected patients.

REFERENCES

1. Bacon, H. E. and Trimpi, H. D. Surgical management of ulcerative colitis. *J. A. M. A.*, 153: 1249, 1953.
2. Miller, G. G., Gardner, C. M. and Ripstein, C. B. Primary resection of the colon in ulcerative colitis. *Canad. M. A. J.*, 60: 584, 1949.
3. Barron, J. and Fallis, L. S. Tube feeding with liquefied whole food. *S. Forum Am. Coll. Surg.*, pp. 519–522, 1953.
4. Fallis, L. S. and Barron, J. Modified technique for total colectomy in ulcerative colitis. *Arch. Surg.*, 67: 363, 1953.
5. Brooke, B. N. The management of an ileostomy, including its complications. *Lancet*, 2: 102–104, 1952.
6. Turnbull, R. B. Management of the ileostomy. *Am. J. Surg.*, 86: 617–624, 1953.

DISCUSSION OF PAPERS BY DRS. BACON ET AL. AND FALLIS

Rupert B. Turnbull (Cleveland, Ohio): Dr. Bacon has again demonstrated his unusual ability to record minutely the end results of a surgical procedure and I congratulate him upon his ability to conduct such a study. I should like to call attention particularly to the portion of his paper dealing with postoperative complications and mortality. Mortality and complications are contributed to in great part by the malfunctioning ileostomy, and the bulk of his figures were accumulated in a period

prior to the introduction of surgical maturation of the ileostomy. Perhaps a word on the technic of maturation is in order. There are two ways to do this: the ileostomy either can be demuscularized and covered with a sleeve of its mucosa and submucosa or it can be made a little too long and then completely everted, covering itself completely, having the free edge sutured to the skin. We have described the first of these methods, whereas Bryan Brooke of England has described the second. Either method is quite satisfactory, the main point being that the serosal surface of the projecting portion of the ileostomy must not be left uncovered to become the seat of serositis and subsequent so-called "dysfunction" or obstruction.

Dr. Fallis has demonstrated the other factor in the surgical treatment of this disease which has reduced complications, that is, removal of all or most of the diseased colon at the time that the ileostomy is made. I should like to stress what Dr. Fallis has already emphasized, namely, that the entire colon and rectum should be removed in one stage only in those patients who are in reasonably good condition. Dr. Fallis has described an ingenious method for removing the rectum from the anterior approach. Following his first report of this method we performed anterior proctocolectomy in a number of patients, and it has many advantages. The only possible disadvantage is contamination of the abdominal cavity, but this has not caused any infections that I know of in our group.

One other small point in the technic of colectomy seems important to me. We all recognize the high incidence of small intestinal obstruction following colectomy. In almost all of the patients whom I have had to reoperate on for this condition, obstruction has been caused by fixation of a loop of small intestine to one of the previously tied vascular pedicles of the colon. The tissue that protrudes beyond the tie on the pedicle should be trimmed close to the tie because this tuft of tissue contains infected lymph nodes and lymphatics, together with the artery and vein and a piece of fat. Microabscesses form in this tuft and it becomes attached to the nearby small intestine. In the process of healing and resolution, traction and fixation of the bowel occur which result in obstruction.

James A. Ferguson (Grand Rapids, Mich.): I would like to ask Dr. Turnbull if he would describe in detail how he closes the right gutter. I have noted that this is sometimes very difficult to do. One is confronted with the problem of either leaving a great, capacious opening or small, multiple loculi.

Harry E. Bacon (closing): The presentation by Dr. Fallis is an excellent one indeed. I do not possess the fortitude to divide across and include the anal skin from the abdominal phase. Dr. Louis Moon of Omaha watched me perform a colectomy a few years ago and said, "Oh, in Omaha, we get much lower than that, Bacon." Under his able guidance I did get down very low, but as yet I have not been able to remove all the anal skin and I am a bit fearful of trying it.

The anesthesia that has proved of utmost value to us in the past three years is known as epidural block. It is far superior to the regular spinal anesthesia.

Dr. Fallis mentioned something that to me is very significant. In making the skin incision, which he does first, he makes a circular incision. We have avoided subsequent complications by making a circular incision instead of a slit incision. It is not sufficient only to make a circular incision through the skin; it should be circularly arranged through the fascia below.

Of eighty-four colectomized patients, we have had one instance of impotence in the male. I might also mention that we take a liver biopsy routinely. We have done little to estimate the incidence of pancreatic dysfunction in these patients with ulcerative colitis, but in thirteen consecutive instances in which we have taken liver biopsies, eleven showed fatty degeneration.

Laurence S. Fallis (closing): I wish to thank Drs. Turnbull and Bacon for their very kind remarks. I must insist that the only reason I have been able to carry this dissection down into the perianal space is because I have a very excellent assistant, Dr. James Barron, who helped make the film. He just will not let me stop until the perianal skin is exposed. I wish to assure Dr. Bacon that it is simply a question of working a little longer. It is really not difficult.

I was interested in Dr. Turnbull's remark about postoperative adhesions. If the omentum is of good texture, I prefer to leave it attached to the stomach, since it does appear to provide some protection.

One patient in our series died from intestinal obstruction due to volvulus. The omentum had been removed and the fixed point of the volvulus occurred at the point where a loop of small intestine had become attached to the remnants of the gastrocolic omentum.

One of the features of malfunctioning ileostomy that has interested me a great deal is this: During the period when the surgical treatment of ulcerative colitis was ill defined, we used to see these patients when they were almost moribund. An emergency ileostomy was often performed by extruding a loop of terminal ileum over a glass rod. Curiously enough, I never saw any of these patients have any trouble with the ileostomy. They always appeared to have better function than those in whom the bowel was sectioned. I wonder if in fashioning the ileostomy we have not been trimming away too much of the mesentery.

Traction Sigmoidoscopy

A. E. Moore, M.D., *San Diego, California*

Having presented the subject of traction sigmoidoscopy to numerous groups, I noted a wide interest in the principle, but very little interest in the individual use of the instrument. Formal presentation, informal discussion and personal conversation with other physicians have repeatedly confirmed the impression so adequately expressed by Dr. Robert Scarborough and by many of you gentlemen, that the average doctor is not particularly interested in examining the rectum, the lower sigmoid colon or the upper sigmoid colon through the endoscope. Any physician who would like to use the traction sigmoidoscope successfully and properly must first have a desire to inspect that portion of the sigmoid colon which cannot be reached with a standard sigmoidoscope. Special training is unnecessary but a careful understanding of the instrument and a little practice are essential.

As previously reported, the traction sigmoidoscope represents the first basic improvement in the sigmoidoscope in the last sixty years. In brief, the instrument is a standard 25 cm. sigmoidoscope with adequate lighting. Mounted on the outside is a sliding suction device. (Figs. 1 and 2.) The suction sleeve that was eventually selected was the result of trial and error experimentation and is the best of eighteen different sleeves which were made and tested upon the human bowel to fulfill the following requirements: (1) Twenty-four ounces of grasping power. Less than this amount has been shown to be inadequate to grasp the bowel, whereas 24 ounces are sufficient to manipulate properly a flexible loop of colon. More grasping power is both unnecessary and possibly dangerous as it would increase the chance of perforation. (2) A design that will accomplish the aforementioned, using no more than 5 inches of mercury vacuum, as larger amounts invariably produce mucosal hemorrhage, whereas 5 inches or less will produce only minor hemorrhages or usually no hemorrhage.

The theoretic considerations and predictions for this sigmoidoscope are continuing to be borne out in actual practice. The curtain rod principle of gathering the intestine upon the outside of the instrument obviously does not work in the rectal segment or the lower 12 cm. of bowel. The suction end must be well into the flexible portion of the sigmoid colon before one can expect to gather it down upon the shaft of the viewing tube. One must, therefore, be able to pass the sigmoidoscope into the sigmoid colon proper before any advantage is obtained by using the suction device. (Figs. 3 and 4.) The presence of formed stool in sufficient amounts to obstruct the circular suction ports will obviously diminish the amount of suction that can be applied and cause a failure to grasp. Large amounts of mucus or retained enema water will rapidly fill the mucus trap, spill over into the suction bulb and consequently interfere in a different manner with proper operation.

The clinical use of the traction sigmoidoscope has proved disappointing in certain respects. Some patients experience a definite sensation of discomfort when the bowel is grasped with suction. The use of the knee-chest or a similar position allows the bowel to be ballooned out with air which must be evacuated by pumping in order for a suction contact to be made. Even then the bowel must actually be lifted up over the sigmoidoscope against the pull of gravity so that this position is not uniformly acceptable for its best operation. Under anesthesia, it has been demonstrated that the left lateral knee-chest position, as developed during the course of this work and as previously described, fulfills all the requirements for proper operation of the sigmoidoscope and for ease of manipulation by the operator. (Fig. 5.) This instrument has been used during colotomy with the abdomen open and has proved to be especially effective in overcoming the difficulty usually encountered in visualizing the splenic flexure.

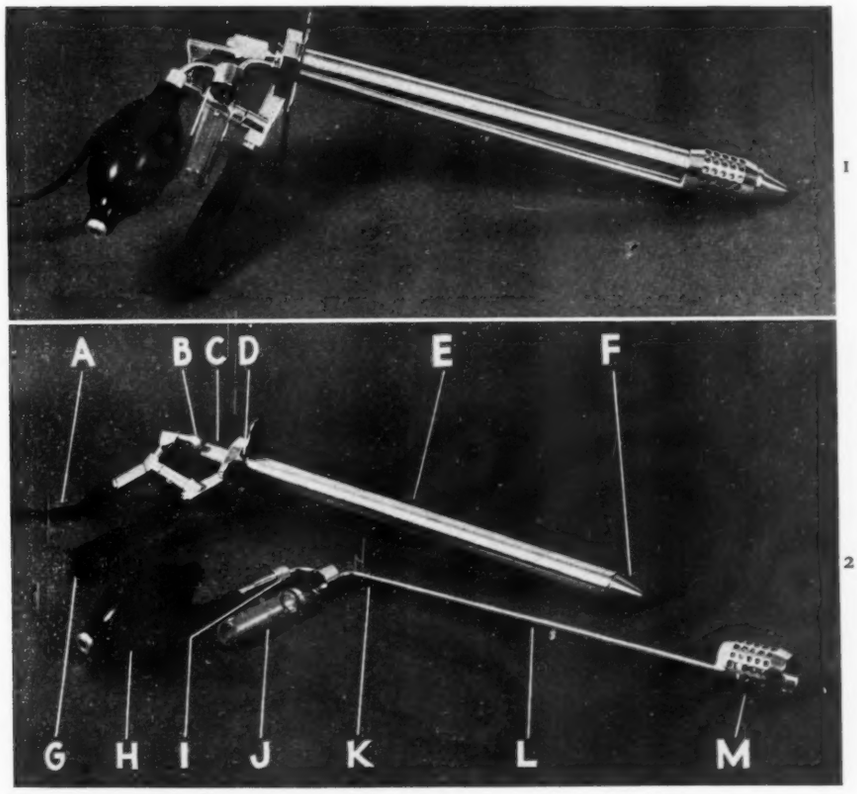


FIG. 1. Traction sigmoidoscope assembled.

FIG. 2. A, light cord; B, light; C, obturator handle; D, slot; E, sheath; F, obturator; G, handle; H, rubber suction bulb; I, release valve; J, mucus trap; K, stop collar; L, suction tube; M, suction sleeve. (Figures 1 and 2 from: Moore, A. *Am. J. Surg.*, 90: 373–380, 1955.)

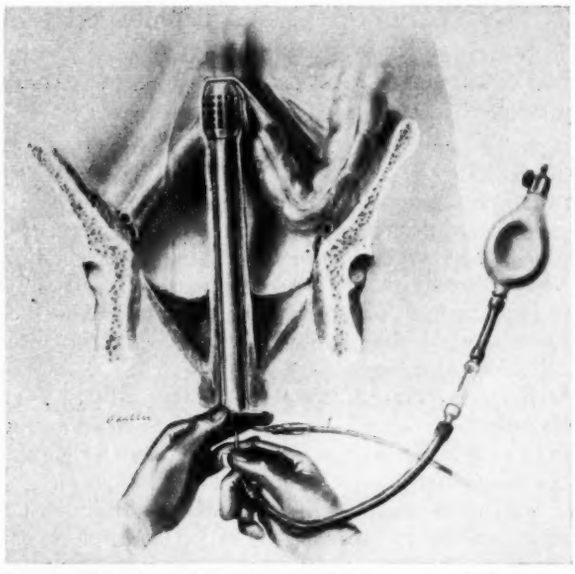


FIG. 3. The sigmoidoscope has been passed full 25 cm. and its tip will be in front of the lumbar vertebra. There is an acute angulation of the bowel back toward the lower left abdomen. A suction grasp is established as shown by the collapsed bulb. (From: Moore, A. *Am. J. Surg.*, 90: 373–380, 1955.)

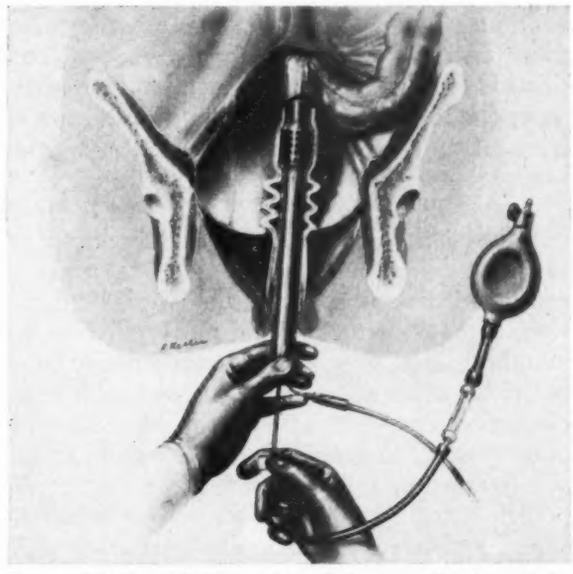


FIG. 4. The bowel above the cul-de-sac reflection of the peritoneum is shown to be telescoped with consequent gain of about 5 cm. of new bowel over the advancing end of the sigmoidoscope. (From: Moore, A. *Am. J. Surg.*, 90: 373–380, 1955.)

Any condition which fixes the sigmoid colon or prevents flexibility will negate the advantage of the traction sigmoidoscope. Some conditions have been noted to produce fixation of the sigmoid, namely, postoperative adhesions, diverticulitis, carcinomatous stricture with inflammatory reaction, previous resection of the colon in some instances, ureterosigmoid anastomosis and short and fat sigmoid mesentery. Specific contraindications to the use of the suction principle are: (1) colitis or proctitis or ulceration with inflammatory disease of that portion of the bowel to which the suction might be applied; and (2) hemorrhagic states in which hemorrhage might be easily induced by trauma to the mucosa of the sigmoid colon.

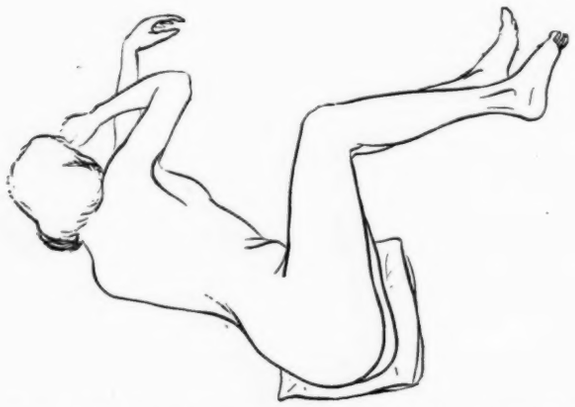


FIG. 5. Left lateral knee position: the patient is on the left side with the back extended, the chest down on the table and the back arched. There is a small pillow underneath the left hip. Both knees and hips are flexed at roughly right angles. (From: Moore, A. *Am. J. Surg.*, 90: 373–380, 1955.)

Seven pedunculated polyps have so far been removed through the traction sigmoidoscope. (Fig. 6.) These polyps were all in the sigmoid colon and were all diagnosed by x-ray examination, as none of them could be reached with a standard sigmoidoscope. In the last five of these patients, a traction sigmoidoscope, 1 inch in diameter, was used and all the patients were anesthetized. In each instance a heavy braided silk ligature was placed around the base of the pedicle prior to removing the polyp with the snare, and in no instance was there any difficulty or concern about hemorrhage. The ligature applicator which was designed for this specific purpose is shown in Figures 7 and 8. The No. 2 silk ligature has been found to slough off and be passed on the third or fourth day following application.

SUMMARY AND CONCLUSIONS

The traction sigmoidoscope is a basic improvement designed to gather the bowel onto the instrument, curtain rod style.

Under proper conditions up to 35 or 40 cm. of bowel can be exposed.

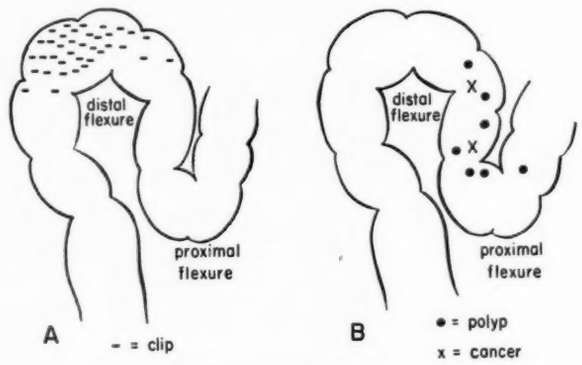


FIG. 6. Scattergram A is reproduced by permission of Shatz and Freitas. (*J. A. M. A.*, 156: 717–719, 1954.) A metal clip was applied to the mucosa during sigmoidoscopic examination, in knee-chest position, of thirty-seven patients, and then was localized by x-ray. The composite shows the average distance reached by this form of examination. Scattergram B represents seven patients with polyps and two patients with carcinoma; all of the lesions have been exposed and either biopsied or removed through traction sigmoidoscope. (From: Moore, A. *Am. J. Surg.*, 90: 373–380, 1955.)

This instrument has a definite place in operative colotomy examinations.

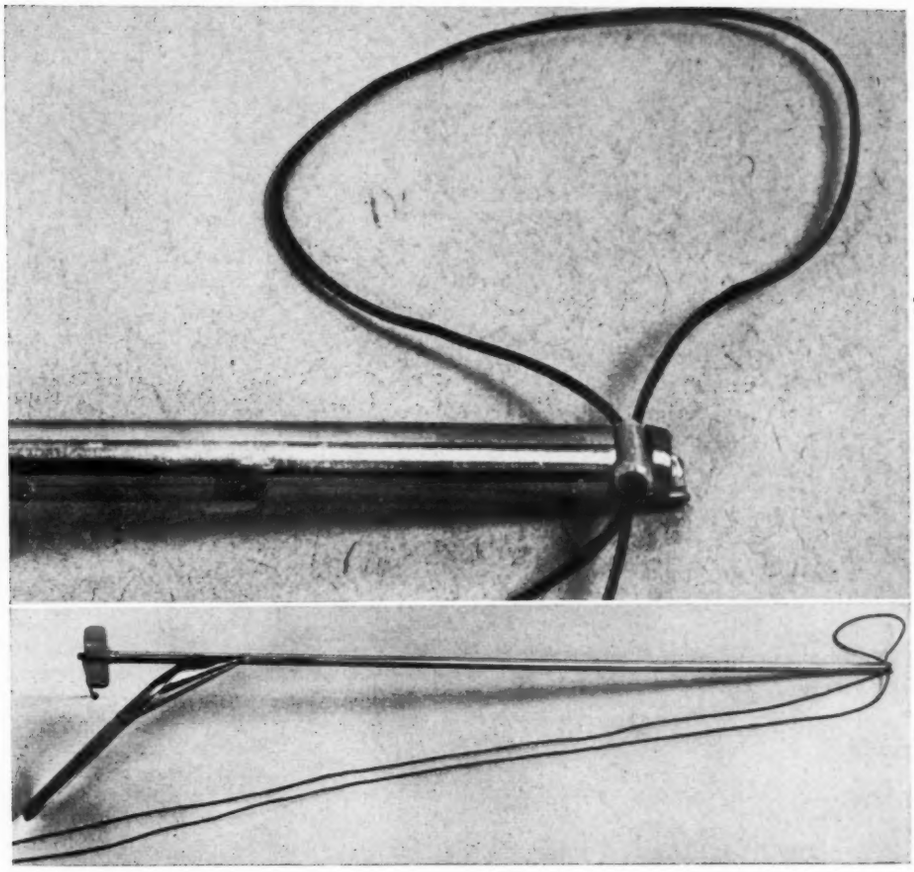
Pedunculated polyps up to 35 cm. can be removed in three of four instances.

DISCUSSION

A. W. MARTIN MARINO (Brooklyn, N. Y.): I have been using a proctoscope since 1918, and the longer I live the more respect I have for a hollow viscus through which an instrument is inserted.

If I find a polypoid lesion, pedunculated or otherwise, in the sigmoid region within the visualization of an ordinary sigmoidoscope (8 or 10 inches), I hesitate to remove the polyp, even though it is within easy reach of a 10 inch sigmoidoscope, for fear of invaginating the bowel over the instrument.

Furthermore, there is always the possibility that there are polyps higher up which are not recognizable even by x-ray. The best roentgenologist will agree that diagnosis of a polypoid lesion of a bowel which is higher than the reach of the instrument is not always possible. This is more or less recognized as a necessary procedure following the discovery of polypi within reach of the ordinary sigmoidoscope.



7

8

FIGS. 7 and 8. Show the ligature carrier and device with the screw handle for crimping the short aluminum tube through which the ligature passes. After tightening the ligature on the base of the polyp, the crimping device is operated, then opened, and the excess amount of ligature is cut away so that it does not hang outside.

As has been said before, the less a man knows about something the more he talks about it. I know nothing about the instrument, but I would say that only an individual who has a great deal of time, who is sure that a patient's bowel is not going to perforate and who is certain that there are no polypi higher up should attempt to remove a polyp within reach of such an instrument.

I say, too, that patients having proctosigmoidoscopy, who on first observation appear to have a normal mucosa, undergo a prolonged procedure of proctosigmoidoscopy. In these persons congestion and devitalization of the mucosa occurs. Therefore, from a theoretic standpoint the use of such an instrument, which requires the pulling down of mucosa from above and threading it over a sigmoidoscope, to me will result in nothing but disaster unless handled by a man who knows all about the instrument, as undoubtedly Dr. Moore does.

RAYMOND J. CONNORS (Fall River, Mass.): I have only one remark. I would like to see a picture in the sigmoidoscope 40 cm. inside the bowel.

A. E. MOORE (closing): Dr. Marino has raised the question of the advisability of using the traction sigmoidoscope for routine examination. I had no intention of implying that this instrument is for anything like routine use for routine sigmoidoscopy. It is a very specialized instrument. It has been a pet hobby of mine for several years and I have no difficulty with it. However, even I use it only on the special occasions outlined in this presentation.

I certainly would agree with Dr. Marino that when one polyp is found in the rectum or colon, every effort must be made to search for other polyps through any method we have available to us.

Briefly, in reply to Dr. Connors' remark, a polyp which had been removed through the sigmoidoscope was found on permanent section to show early malignant degeneration. When the abdomen was opened for resection, the base of the polyp could be palpated. At this time a rectal catheter was passed up to the base of the polyp. When the catheter was measured it was found that the distance reached was 35 cm.

May I again say that this instrument was not presented or designed for ordinary everyday use.

Vascular Invasion in Carcinoma of the Colon and Rectum

FRANCIS J. BURNS, M.D. AND JOHN PFAFF, JR., M.D., *St. Louis, Missouri*

From the Departments of Surgery and Pathology, St. Louis University School of Medicine, St. Louis, Missouri.

VASCULAR dissemination of colonic and rectal carcinoma has been recognized for many years. However, until recently, most investigators have directed their attention primarily toward the lymphatic spread of such malignancies. The organ most commonly seeded by these tumors is the liver and while lymph channel metastasis to this organ is possible, its occurrence is unlikely. Since almost the entire venous drainage of the large intestine passes through the liver via the portal system, local tumor invasion of blood vessels would seem of greater significance.

TABLE I

Anatomic Site	No. of Cases	Per cent of Cases
Rectum	164	48
Rectosigmoid	34	10
Sigmoid	61	18
Left colon	19	6
Transverse colon	19	6
Right colon	41	12
Total	338	100

Standard textbooks[1–4] either discuss such vascular invasion briefly, or indicate that it occurs only in a relatively small percentage of cases. Investigators particularly interested in this problem have reported variable results. By gross examination primarily, Dukes and Bussey[5] found venous tumor involvement in 17 per cent of rectal carcinomas. At the Mayo Clinic two different groups,[6,7] utilizing venous radiography, report 38 per cent and 43 per cent vascular invasion respectively. Others,[8–12] mainly employing histologic methods of examination, have indicated blood vessel invasion varying from 19 per cent to 61 per cent.

Few observers have stressed the finding of malignant tumor cells within small vascular channels in and about the primary neoplasm. This study stresses the means of identification and the invasion of these small vessels by malignant cells. In addition, an attempt is made to correlate the incidence of this invasion with subsequent embolic tumor dissemination.

TABLE II

	No. of Cases	Per cent of Total
Surgical tumor resection	276	82
Autopsy	92	27
Surgical resection with autopsy	38	11
Autopsy only	54	16
Biopsy of the liver only	8	2

METHODS AND MATERIALS

During a ten year period from 1940 through 1949, there were 571 cases of clinically diagnosed colonic and rectal carcinoma at Firmin Desloge and St. Mary's Hospitals. Of these, 338 were suitable for purposes of this study. Criteria of case selection included surgically resected and/or autopsied malignant epithelial tumors on which there was adequate tissue for evaluation of vascular invasion. Cases of metastatic neoplasia proved by biopsy of the

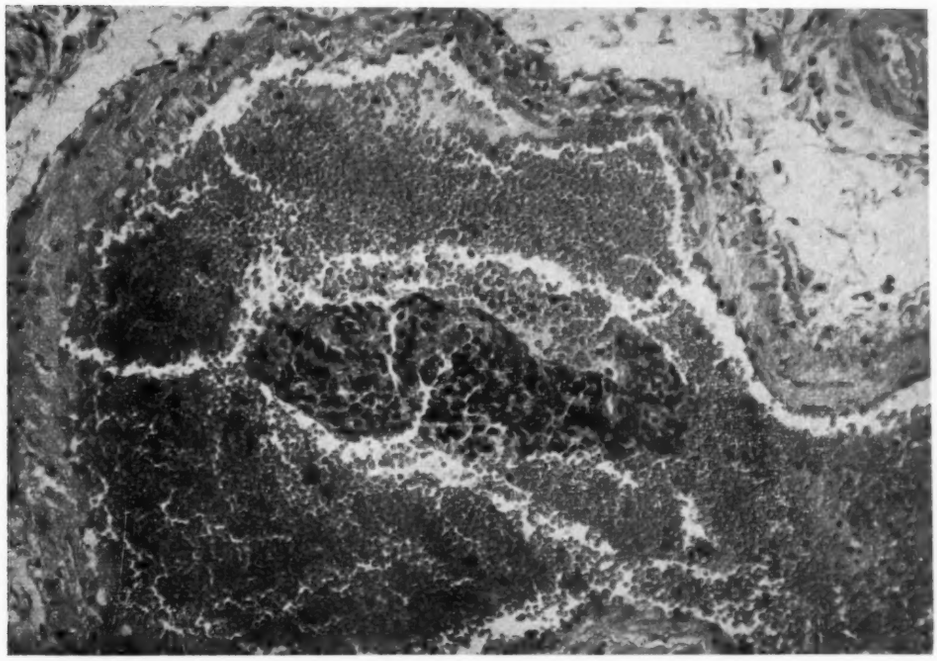


FIG. 1. Easily identifiable vein containing blood and tumor cells; hematoxylin and eosin stain, × 75.

TABLE III

Anatomic Site	No. of Cases	No. with Venous Invasion	Per cent with Venous Invasion
Rectum and rectosigmoid	198	93	46.9
Colon	140	75	53.6
Total	338	168	49.7

TABLE IV

	No. of Cases	Per cent of Cases
Microscopic venous invasion with vascular metastasis	60	74
Microscopic venous invasion without vascular metastasis	21	26
Total	81	100

liver were included only if the primary site of origin had been established. Adenomatous polyps showing only mucosal malignant change were excluded since controversy prevails concerning the malignancy or benignancy of these lesions.

Table I illustrates the anatomic tumor distribution which, when compared with previous statistical surveys, indicates a representative case group.

Table II indicates case disposition. Some of the cases grouped under "surgical tumor resection" represent incomplete tumor excisions performed as a palliative measure only.

Histologic identification and differentiation of small veins, venules and lymph channels is in many instances extremely difficult. Special histochemical technics, such as the Masson trichrome and the Weigert elastic tissue stains, were utilized when necessary to identify larger blood vessels. Routine hematoxylin and eosin preparations, however, were adequate in most instances. (Fig. 1.) Other criteria were found to be useful in identifying vessels of smaller caliber. They are as follows: intraluminal blood following the endothelial contour; (Fig. 2) communication with an identifiable vessel, usually of larger caliber; and number of endothelial cells, greater in venules than lymph channels. (Figs. 3 and 4.)

Similar criteria were effective in evaluating the tumor thromboembolic process. Neoplastic

FIG. 2. Venule showing intraluminal blood which follows endothelial contour and contains tumor cells; hematoxylin and eosin stain, original magnification × 250.

TABLE V

Cause of Death	No. of Cases	Per cent of Cases
Metastasis	68	57
Regional extension	11	9
Neither metastasis nor regional extension	40	34
Total	119	100

cells must either fill the vessel and follow an endothelial contour or be enmeshed within intraluminal blood. Careful interpretation is necessary in order that blood or tumor elements carried, by microtome sectioning, from adjacent stroma to an intraluminal position are not mistaken for intravascular components.

Histologic evaluation of the resected tissue was done separately from and without knowledge of the clinical findings or subsequent autopsy examination.

FINDINGS

Of these 338 cases, all were adenocarcinomas with the exception of one rectal squamous cell tumor. No attempt was made to classify or grade these tumors according to their relative invasive tendency, or to subdivide particular carcinoma variants (such as scirrhous, mucinous, and the like).

There were 158 (46.7 per cent) men and 180 (53.3 per cent) women. The average age of the patient at the time of initial examination of the tissue was fifty-nine years. The youngest was twenty-five and the oldest eighty-four years of age.

Table III illustrates the frequency of venous invasion related to the tumor anatomic distribution. These results are based either upon the histologic findings of venous thromboemboli in the tissue specimen or on the morphologic identification of liver metastases.

A large number of cases in which no evidence of gross visceral metastasis was observed at the time the tumor was resected revealed microscopic neoplastic invasion of blood vessels in the operative tissue specimen. Only a relatively small number of these were able to be evaluated subsequently for metastatic vascular dissemination. Table IV indicates the frequency of metastasis in these cases and is based upon postmortem examinations, gross findings of secondary surgical procedures and subsequent tissue biopsy specimens.

The cause of death was determined in 119 (35 per cent) of the total cases studied. The

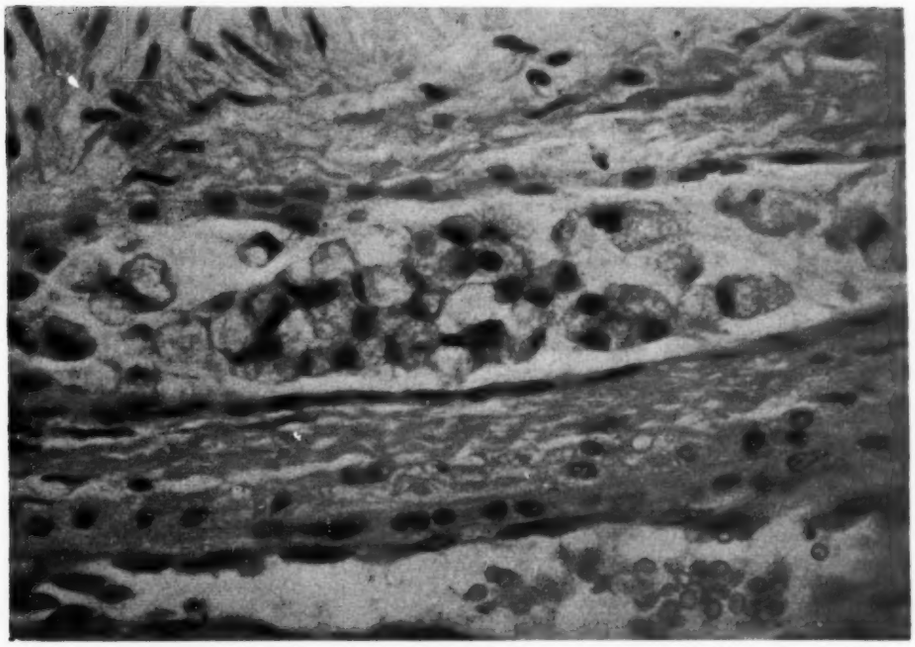


FIG. 3. Venule showing numerous endothelial cells and containing tumor cells; hematoxylin and eosin stain, × 250.

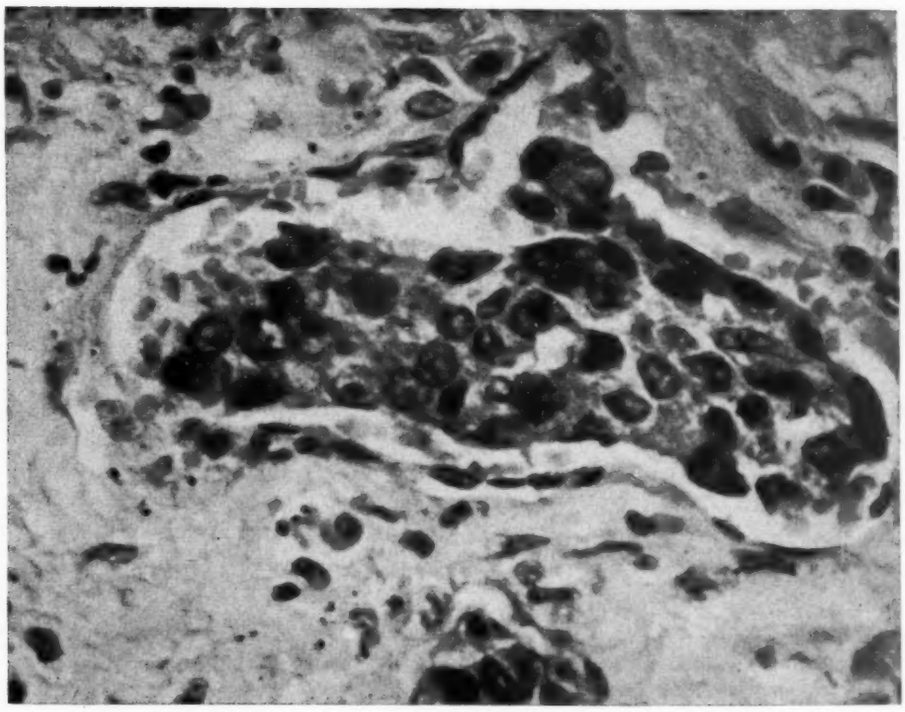


FIG. 4. Venule showing numerous endothelial cells and containing blood and tumor cells; hematoxylin and eosin stain, × 250.

majority (77 per cent) were evaluated by autopsy examination. In the remaining cases (23 per cent), roentgenograms, visceral organ biopsies or patient symptomatology indicated a predominant lethal factor. Table v represents this evaluation.

Tumor invasion of lymph channels was noted in 290 (85.8 per cent) of the 338 cases. This finding would seem of significance as regards complete evaluation in a study of tumor dissemination. It bears no direct relationship to the primary purpose of this investigation however, and will therefore not be included in subsequent discussion.

COMMENTS

The total percentage of blood vessel tumor invasion obtained in this study (49.7 per cent) is significantly higher than that previously reported by many investigators. This may be due in part to the exclusion of preinvasive mucosal carcinomas from the group studied. The inclusion of ten such cases, none of which revealed vascular tumor invasion, would have lowered the percentage to 48.2. The major factor responsible for this higher percentage however, would appear to be the emphasis placed upon tumor invasion of minute vascular channels.

There are several factors which probably indicate an even greater percentage of vascular invasion than this study reveals. Material utilized was that obtained from routine pathologic examination. Certainly a higher incidence would be expected if all tissue were sectioned from a standpoint of determining such invasion. Further, some equivocal examples of tumor thromboembolism unquestionably could be proved by the examination of additional tissue. In addition, many tumors considered inoperable because of widespread visceral metastases (obvious vascular dissemination) were excluded since no tissue was removed.

Others[6,7,9] in smaller series of cases have previously reported a higher incidence of vascular invasion from rectal lesions than from those in the colon. Results of this study as shown in Table III do not indicate a significant difference.

The results as indicated in Table IV tend to emphasize the prognostic significance of tumor invasion of small venous channels. In a large majority of cases (74 per cent), subsequent vascular dissemination occurred. In 26 per cent of cases with no evidence of metastasis, one or more of several factors may have been implicated. It is possible that all tumor tissue was removed at operation prior to tumor embolization, or that the patient died before metastases were recognizable. One may speculate that in other cases tumor thrombi would never become emboli, or that if disseminated the emboli would remain dormant or die.

Of the 119 cases evaluated terminally as regards the cause of death, a majority (57.2 per cent) revealed visceral metastasis as the most significant lethal factor. A small number (9.3 per cent) comprised cases of regional tumor extension. These invaded locally, causing death by interference with adjacent vital structures (such as, ureteral obstruction with pyelonephritis and terminal uremia). This small proportion indicates that the growth pattern of colonic and rectal carcinomas is not one primarily of local extension. Approximately one third (33.5 per cent) of cases revealed no evidence of either metastasis or regional extension of significant import to be considered other than minor contributing factors in the cause of death. Many were aged individuals who did not tolerate extensive surgical procedures. Pulmonary embolism, pneumonia and congestive heart failure were major causes of death in this group.

CONCLUSION

From clinico-pathologic analysis of 338 cases selected from a total of 571 cases of colonic and rectal carcinoma reviewed, the following findings appear significant:

1. Carcinomas of the colon and rectum invade blood vessels with more frequency than has previously been reported by many investigators.

2. Carcinomas of the rectum and rectosigmoid reveal approximately an equal tendency to vascular invasion when compared with those in the colon.

3. A majority (74 per cent) of patients with histologic vascular tumor invasion at the time of surgical carcinoma excision ultimately show neoplastic metastases.

4. A majority of patients with colon and rectal carcinoma die primarily as a result of visceral metastasis; relatively few of regional tumor extension; and approximately one third of non-associated complicating factors.

REFERENCES

1. Anderson, W. A. D. Pathology. St. Louis, 1953. C. V. Mosby Co.

2. Ackerman, L. V. Surgical Pathology. St. Louis, 1953. C. V. Mosby Co.
3. Boyd, W. A Text-Book of Pathology. Philadelphia, 1947. Lea & Febiger.
4. Moore, R. A. Text-Book of Pathology. Philadelphia, London, 1951. W. B. Saunders Co.
5. Dukes, C. E. and Bussey, H. J. R. Venous spread in rectal cancer. *Proc. Roy. Soc. Med.*, 34: 571–574, 1941.
6. Barringer, P. S., Dockerty, M. B., Waugh, J. M. and Bargen, J. A. Carcinoma of the large intestine. *Surg., Gynec. & Obst.*, 98: 62–73, 1954.
7. Madison, M. S., Dockerty, M. B. and Waugh, J. M. Venous invasion in carcinoma of the rectum as evidenced by venous radiography. *Surg., Gynec. & Obst.*, 99: 170–178, 1954.
8. Dunning, E. J., Jones, T. E. and Hazard, J. B. Carcinoma of the rectum. *Ann. Surg.*, 133: 166–173, 1951.
9. Grinnell, R. S. The spread of carcinoma of the colon and rectum. *Cancer*, 3: 641–652, 1950.
10. Seefeld, P. H. and Bargen, J. A. The spread of carcinoma of the rectum: invasion of lymphatics, veins and nerves. *Ann. Surg.*, 118: 76–90, 1943.
11. Sunderland, D. A. The significance of vein invasion by cancer of the rectum and sigmoid: a microscopic study of 210 cases. *Cancer*, 2: 429–437, 1949.
12. Brown, C. E. and Warren, S. Visceral metastasis from rectal carcinoma. *Surg., Gynec. & Obst.*, 66: 611–621, 1938.

DISCUSSION

A. F. Castro (Washington, D. C.): The paper just presented by Drs. Burns and Pfaff is indicative of the modern, more intensive and extensive study of cancer. The way in which cancer spreads is just one facet of this field, but a most important one if we are to prevent it.

As the authors pointed out, we have known for many years that cancer can spread via the vascular routes, but it has not been until recent times that studies have been successfully geared to the unequivocal demonstration of how this happens. The authors' paper today is one of several important articles on vascular invasion of cancer of the colon and rectum which have appeared in medical journals in the last decade or so.

Before 1952, the average percentage of venous involvement was 28 per cent. It is important to note here that the first good study was that of Brown and Warren, and they reported 61 per cent. Subsequent to that, the percentage found by other investigators has dropped considerably. Dr. Dukes' cases were all on gross examination only, so I imagine his percentage should be increased at least twice as much as this if he would include in these cases the ones studied microscopically.

Several others have since been reported. Barringer, Dockerty, Waugh and Bargen demonstrated gross venous invasion by cancer by means of radiography. Turnbull and Fisher stated that in 32 per cent of the twenty-five cases they studied, tumor cells were recovered from the blood of the major mesenteric venous channels.

The studies of this mode of spread of cancer of the colon and rectum have been consciously or subconsciously instigated by the realization that patients with apparently non-invasive and therefore curable lesions of the colonic mucosa could and did die a few months later with widespread metastases to the liver, lungs, brain and sometimes superficially to the skin.

In Table IV of Dr. Burns' paper there was no reference to cases in which vascular metastases developed later on without apparent pathologic evidence of venous invasion. The explanation of this fact is not supplied by lymphatic spread because no pathologic evidence of lymphatic invasion is present.

If we stop and think of the enormous number of capillaries, arterioles and venules situated in 1 sq. cm. of bowel wall, and also think of the average size of a cancer of the colon or rectum when surgery is performed, it is surprising that these investigations have not been able to demonstrate vascular invasion in more than 50 per cent, as Dr. Burns and Dr. Pfaff's figures demonstrate.

It seems pertinent to state that the larger the lesion, the greater the chance of venous invasion.

I agree with the authors that there are many factors playing a part in this type of spread. For instance, the study of a cancer for the presence of venous involvement cannot be accurate until numerous sections are made of the entire tumor, or until venous involvement is demonstrated either by penetration of the wall, seen in microscopic section, or by the presence of cancer cells in the venous blood of the specimen.

Is it possible that cancer cells are constantly carried to the liver in all cases of malignancy of the colon and rectum, but that the liver is capable of destroying them in the great majority of cases? Are all these cells capable of establishing a pathologic metastasis?

These and other factors that still remain unanswered are intimately associated with the modus operandi of the cancer cells and the subsequent death of the pathologic cell.

The paper presented is well prepared, and I am sure it is only the beginning of further investigation by the authors along these lines.

Francis J. Burns (closing): I agree with Dr. Castro that the percentage probably should be higher than is recorded. It probably would be, if more sections were taken, but this presents quite a problem for the laboratory.

A practical implication to be drawn from an investigation of this sort is that the operator should do a high ligation of the blood vessels and should do it before there is very much if any manipulation of the primary growth.

The Surgical Management of Presacral Tumors

ROBERT J. ROWE, M.D., *Dallas, Texas,* AND DEWITT T. BROCK, M.D., *Jackson, Mississippi*

From the Department of Proctology, Baylor University Hospital, and the Department of Surgery, Division of Proctology, The University of Texas-Southwestern Medical School, Dallas, Texas.

THE relatively rare occurrence and great variety (Table 1) of presacral tumors has precluded the accumulation of a comprehensive knowledge of these lesions. In general, they have been discussed adequately in numerous excellent publications.[1,13,14,19,22,25,26,30] Recently Bowers,[5] Hays,[17] MacCarty[24] and Shackelford[32] have clarified to a great extent the removal of presacral tumors which involve the sacrum. Implications in the literature that the removal of such lesions from this inaccessible location is simple are somewhat misleading, and certain points in the technic of their removal have not been defined clearly. The challenging problems which were encountered in the management of three unusual presacral neoplasms (ganglioneuroma, fibrosarcoma, Hodgkin's granuloma) emphasized the complexities of their diagnosis and treatment. These cases will be reported and the incidence, pathology, diagnosis and therapy of these tumors will be discussed. A critical analysis of the cases, a review of the pertinent literature and an anatomic study will form the basis for a discussion of the surgical management of presacral tumors.

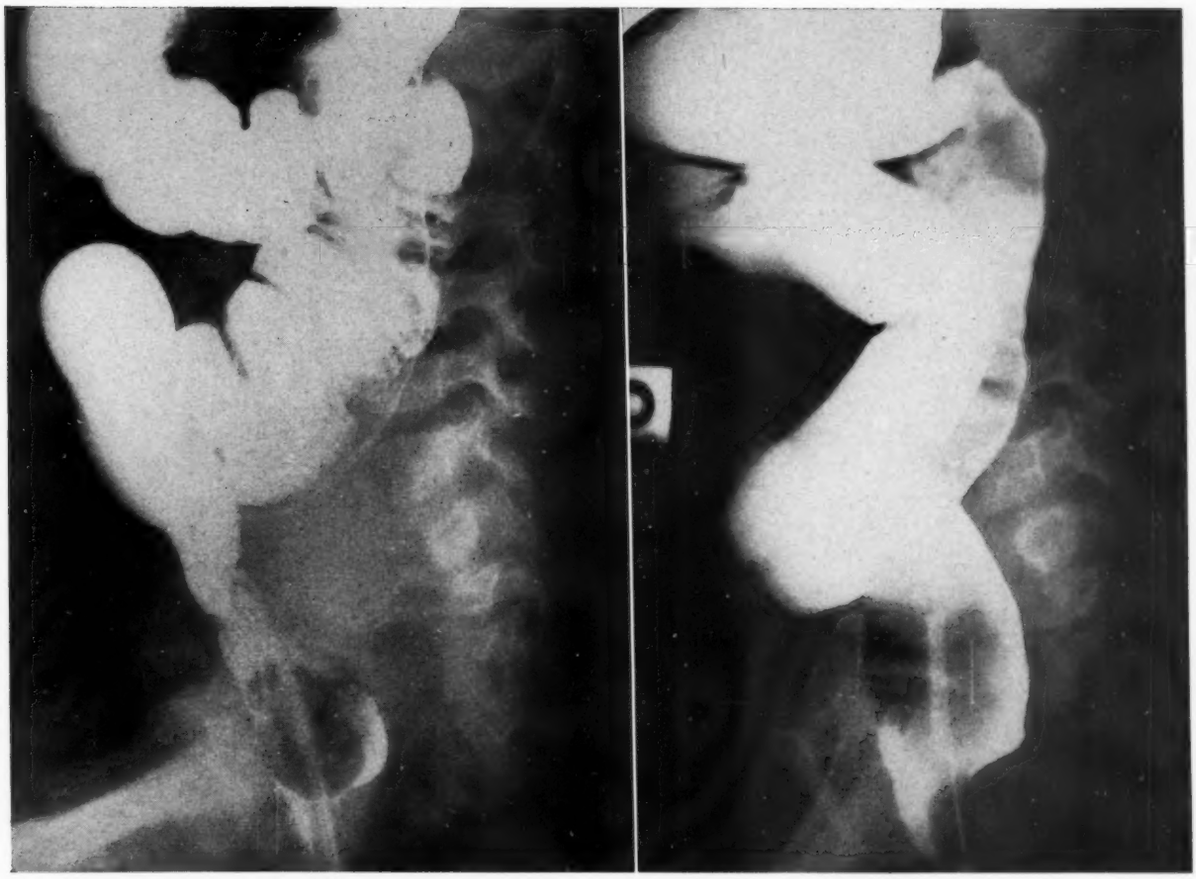
TABLE 1
CLASSIFICATION OF PRESACRAL TUMORS

I. Congenital	C. Chondroma and chondrosarcoma
A. Chordoma	D. Osteoma
B. Dermoid and developmental cysts	IV. Fibrogenic
C. Teratoma	A. Fibrosarcoma
D. Anterior meningocele	V. Myogenic
E. Ectopic kidney	A. Leiomyoma and leiomyosarcoma
II. Neurogenic	VI. Inflammatory
A. Ependymoma	A. Abscess
B. Neurofibroma	B. Granuloma
C. Neurilemmoma	VII. Miscellaneous
D. Ganglioneuroma	A. Lymphoblastoma
E. Paraganglioma	B. Lipoma
III. Osseous	C. Hemangioendothelioma
A. Giant-cell tumor	D. Metastatic carcinoma
B. Osteogenic sarcoma	E. Ovarian cyst
	F. Hypernephroma
	G. Adenomyoma

GANGLIONEUROMA

CASE 1. R. L., a three and a half year old white female child, was first seen on August 21, 1953. She apparently had been having pain and discomfort in the region of the rectal outlet for nine months. The mother had not been able to establish a bowel habit. Examination revealed nothing of significance. It appeared that this was a psychogenic problem. The child continued to have discomfort but was not seen again until January 25, 1954. Again examination failed to reveal any definite abnormality. Barium enema films were suggestive of an extrinsic pelvic tumor. These were repeated on January 27th and the rectum was found to be displaced anteriorly and to the right. (Figs. 1 and 2.) Under general anesthesia on February 4th, bimanual examination revealed a large presacral tumor at least 9 to 10 cm. in diameter arising from the upper sacrum. (Fig. 3.) It was hard and firmly adherent to the presacral fascia and pelvic wall. Except for displacement of the upper rectum anteriorly and to the right, proctosigmoidoscopy was negative. Urologic consultation revealed indentation of the bladder posteriorly by an extrinsic mass but no evidence of invasion. There was a duplicated left kidney and ureter. A neurosurgical consultant found no abnormalities and no evidence of intraspinal tumor.

On February 9th, after preparation of the bowel, exploratory laparotomy revealed a large, firm, pre-



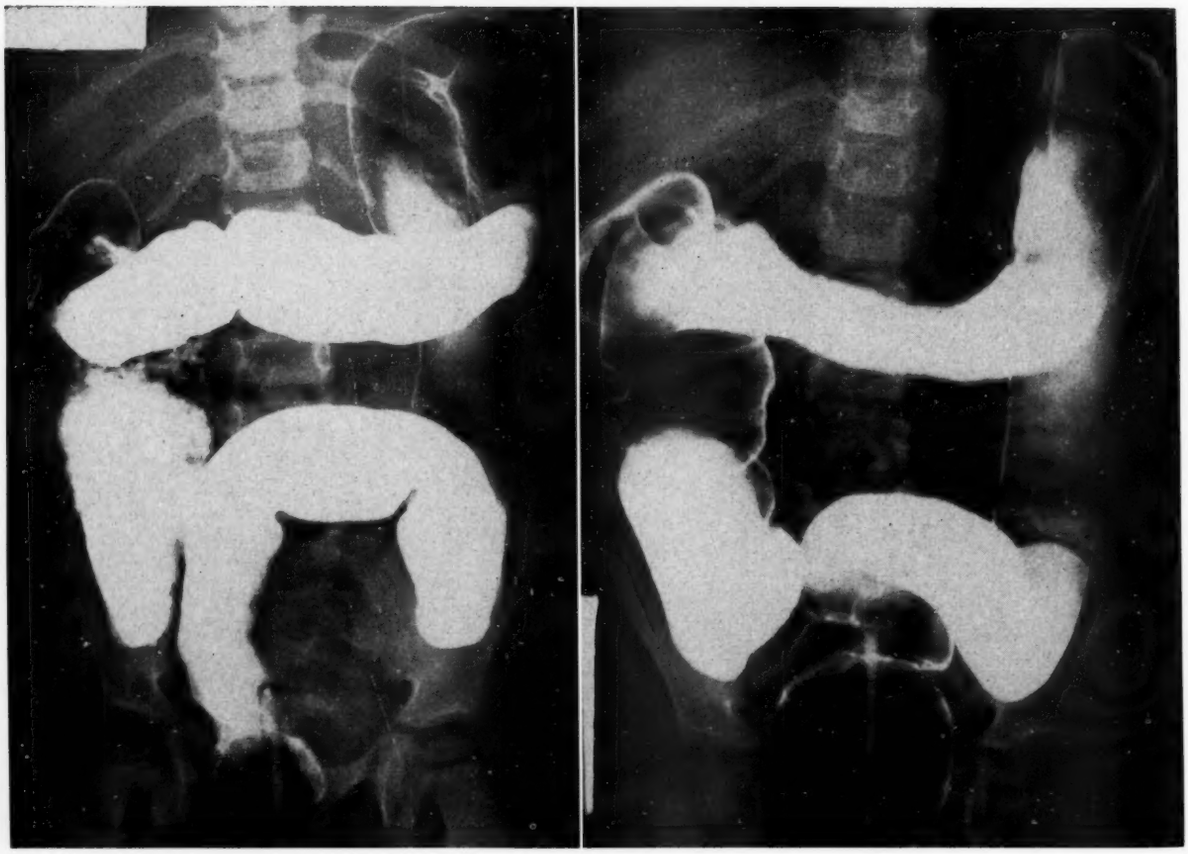
1A 1B

FIG. 1. Case 1. A, lateral view of the rectum, prior to surgery. Slight distortion of sacral segments 2 and 3. B, same view after removal of the large ganglioneuroma.

sacral tumor at least 10 cm. in diameter pushing the rectum forward and slightly to the right of the midline. The rectum was mobilized, and both ureters were identified and separated from the mass which was found to have a broad attachment anteriorly and to the left of the second and third sacral vertebrae. It was impossible to expose the base of the tumor from an anterior approach. Since the lesion was well circumscribed and did not appear to be invasive, a biopsy specimen was taken for frozen section. This was reported as a fibrosarcoma. In view of the benign character of the majority of the fibrosarcomas, the massiveness of the tumor, its broad pedicle (Fig. 3) and relative avascularity, the major portion of the tumor was removed in large pieces with the electrosurgical knife. The remaining base of the tumor was approximately 6 by 5 by 1.5 cm. The decision was made to remove the remainder of the tumor at a second operation since it appeared that removal of a portion of sacral segments 2 and 3 would be necessary for complete removal.

Fortunately, the permanent sections revealed that this tumor was a benign ganglioneuroma. After adequate bowel preparation, on February 18th a plastic tube was inserted into the saphenous vein, the child was placed in the prone position and a midline incision was made from the upper sacral region to the posterior perianal margin. The incision was deepened to expose the sacrum, coccyx and gluteus maximus muscles. The ligamentous and muscular attachments of the coccyx and lower sacrum were divided. The coccyx and major portion of the fifth sacral segment were removed. The levator muscles were divided and retracted to expose the retrorectal and presacral area. Even with this extensive incision the remaining portion of the tumor was still somewhat inaccessible. All visible tumor was removed with the electrosurgical loop and the area from which it was removed was coagulated thoroughly.

The gross specimen consisted of several fragments, the largest of which measured 9.5 by 5 cm. and the other fragments varied between 5 cm. and 3 cm. in diameter. Their estimated weight was 450 gm. The sectioned surfaces were moist



2A 2B

FIG. 2. Case 1. A, barium enema prior to surgery demonstrating marked displacement of the rectum to the right. B, same view after removal of the tumor.

and glistening and had a dull gray-yellow color; the consistency was firm and homogeneous. Microscopic examination of multiple sections demonstrated large numbers of well differentiated ganglion cells arranged in isolated forms in small and large groups (Fig. 4) with well differentiated myelinated nerve trunks supported by an abundant, loosely arranged, gliomatous stroma. The diagnosis was benign ganglioneuroma of the presacral area.

Following the second operation on February 19, 1954, the specimen submitted for examination consisted of aggregates of cauliflower-like tissue which totally measured 6 by 4 by 2 cm. Gross and microscopic findings were essentially the same as those on February 9th.

Except for the fact that the patient still must be given daily enemas, her convalescence has been uneventful. Recently, she has been having occasional voluntary stools. Vesical function is normal, recent neurologic examination was negative, and examination under anesthesia revealed no evidence of residual tumor. Barium enema studies were normal. (Figs. 1 and 2.)

Ganglioneuromas are rare tumors arising from the ganglion cells of the sympathetic nervous system. Apparently, the first presacral ganglioneuroma was reported by Smith[33] in his "Treatise On Neuromata" in 1839. Another presacral tumor which also appears to have been a ganglioneuroma was reported by Genersch in 1849. Steinberg,[34] in an excellent review of this subject, recently reported a large presacral ganglioneuroma in a four and a half year old child. He was able to find only twenty-eight similar cases of patients under seventeen years of age reported in the literature in which the tumor occurred in the lumbosacral retroperitoneal area. Only two of these were in the presacral region. Including these cases, as well as their own, the authors were able to confirm only twelve cases of presacral ganglioneuromas which had been reported in the literature. These have been summarized in Table II.

In view of their origin, which appears to be congenital, it is not unusual that ganglioneu-

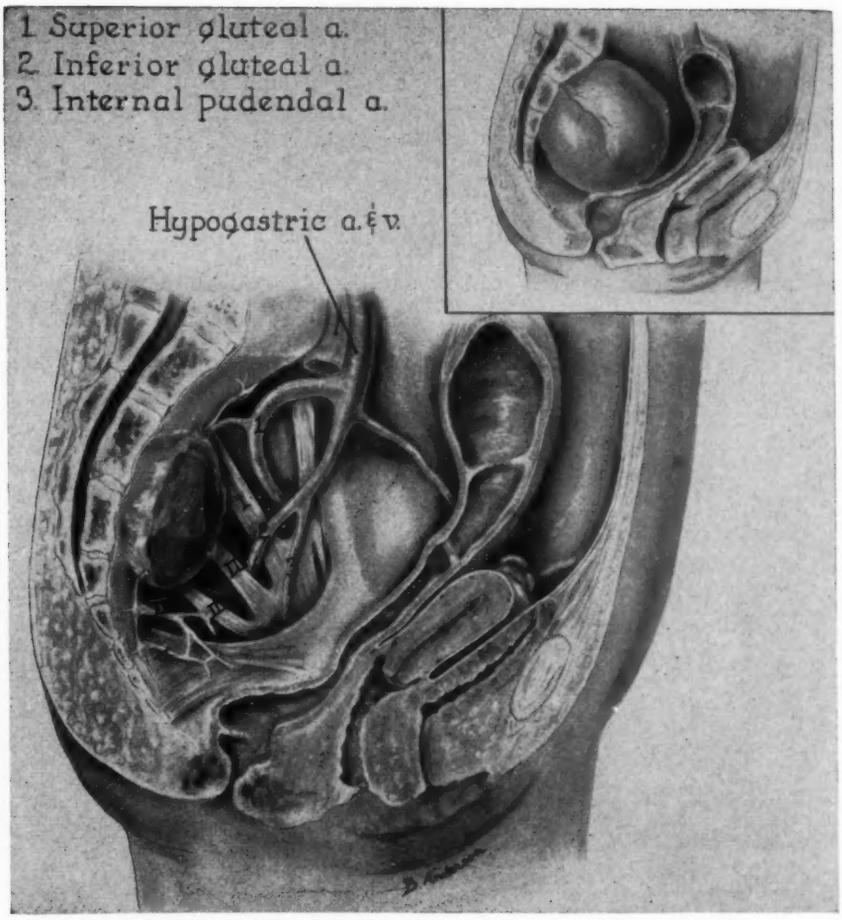


FIG. 3. Case 1. Presacral ganglioneuroma prior to (insert) and subsequent to partial removal by abdominal approach.

romas have occurred in the scalp, cranium, eye, neck, thorax, retroperitoneal, lumbar, pelvic and abdominal regions, suprarenal glands, vertebral column and central nervous system. Ganglioneuromas tend to compress or distort rather than infiltrate, although they do invade locally and also by way of the lymphatic system. Unfortunately, they occur frequently in inaccessible areas. Stout[35] has reported that 25 per cent show some degree of anaplasia. Others have an odd mixture of cells varying from complete differentiation through all stages of undifferentiation to some which are completely anaplastic. About 18 per cent of these tumors will metastasize. They may also occur in conjunction with other neurogenic tumors in which there are multiple neurogenic elements.[9] The gross and microscopic characteristics of the ganglioneuromas have been described by Stout.[35]

Since ganglioneuromas usually grow so slowly, symptoms are varied and depend upon their location as well as the structures involved. A consistent symptom of all presacral ganglioneuromas has been pain in the lumbosacral area which has no obvious origin. In one patient reported by Adson[1] there was erosion of the sacrum which could be detected by roentgenography. Displacement of the rectum can be detected usually by barium enema examination. (Figs. 1 and 2.)

The treatment of choice for ganglioneuromas is complete surgical extirpation. When this is accomplished, permanent cure results. Radiation has appeared to be helpful in some cases but is eventually valueless.

FIBROSARCOMA

CASE II. K. T., a sixty-nine year old white woman, was seen first in the outpatient clinic because of constipation and rectal tenderness which had started approximately three weeks before in March, 1951.

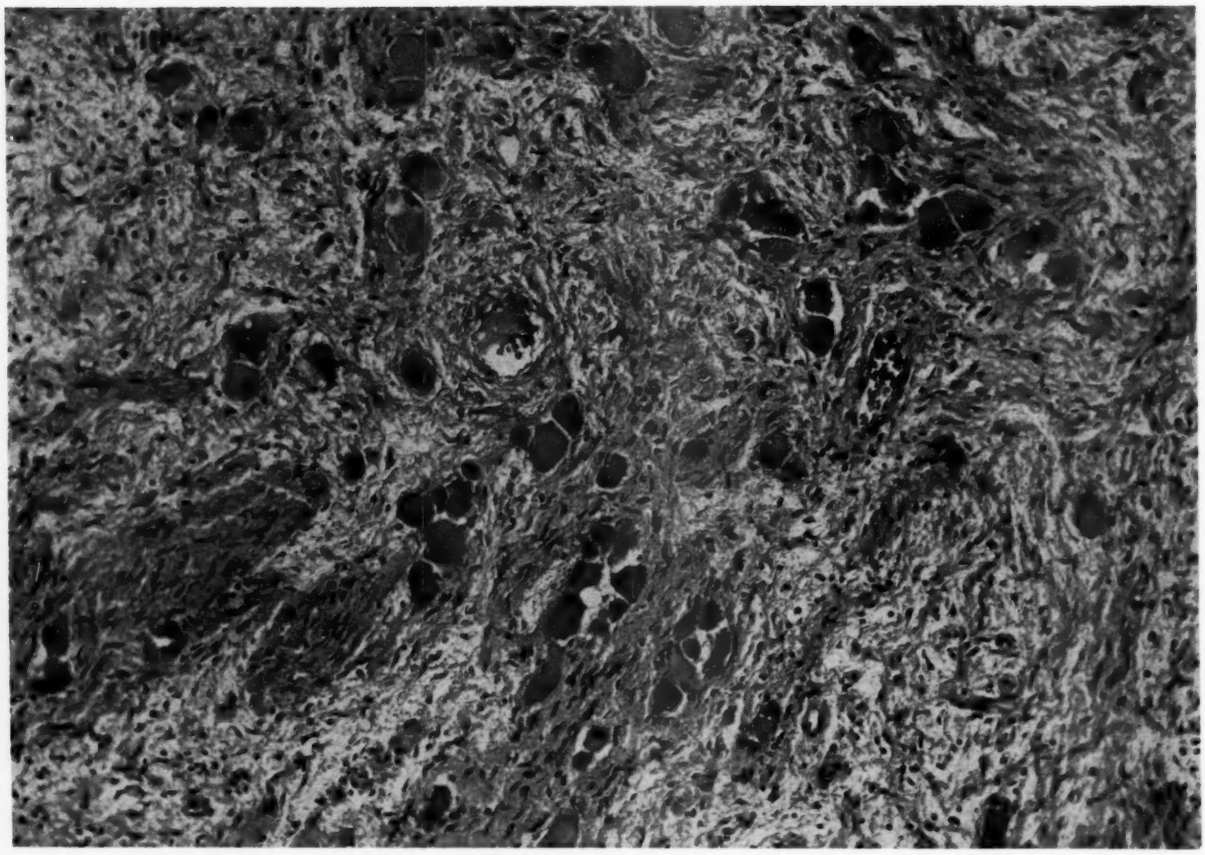


FIG. 4. Case 1. Photomicrograph demonstrating typical ganglion cells of the ganglioneuroma. Original magnification, × 150.

On rectal examination a firm, very tender mass, measuring approximately 6 by 4 cm., could be palpated through the posterior wall of the rectum slightly to the left of the midline. This mass was fixed to the sacrum. On proctosigmoidoscopy the mucosa of the rectum was freely movable over this mass which protruded into the posterior wall of the rectum at about 8 cm. from the anorectal line. No generalized lymphadenopathy was present. Neurologic examination was negative. Laboratory examinations were normal. Barium enema was not completely satisfactory as the patient immediately expelled the barium, but no significant abnormalities were noted. Lateral views were not taken of the rectum filled with barium but roentgenograms of the lumbosacral spine revealed no evidence of bony involvement.

The bowel was prepared with sulfathalidine® and oral streptomycin. On April 11, 1951, under endotracheal anesthesia, the patient was placed in jackknife position. A linear incision was made extending over the full length of the coccyx and lower end of the sacrum. The coccyx was removed together with the lower end of the sacrum (sacral 5 and part of 4 on the left side). The tumor mass was now palpable and seemed to be attached densely to the presacral fascia. A biopsy specimen of the tumor was taken for frozen section and reported as a fibrosarcoma. The capsule of the tumor was closed. An attempt was made to separate the tumor from the rectum, but this was impossible due to infiltration of the tumor tissue through the muscular wall of the posterior part of the rectum. In view of these findings an elliptic incision was made around the anus. The rectum was freed and transected approximately 5 cm. above the tumor mass. The pedicle of the tumor seemed to arise from the second sacral foramen anteriorly on the left side. Significant proximal lymphatic spread along the inferior mesenteric was thought to be unlikely. Since the lesion did not appear to arise primarily from the rectum and in view of the previous extensive pelvic surgery (patient had had a hysterectomy, ureteral injury and subsequent ureterovesical anastomosis), a decision was made to perform a Lockhart-Mummery type of resection. The transected rectum was closed through the perineum and a diverting type of sigmoid colostomy was constructed in the left lower quadrant. The patient had essentially

TABLE II

SUMMARY OF CASES OF GANGLIONEUROMAS REPORTED IN THE LITERATURE

Author	Year Reported	Sex and Age of Patient	Size and Location of Tumor	Symptoms	Operation	Results
Smith[33]	1849	?, ?	15 × 12.5 cm.; arose from sacral nerves; filled true pelvis and involved sacral fascia	Pressure on bladder and rectum	Necropsy	.....
Genersch[12]	1870	M, 22	Generalized with multiple tumors in presacral area; size of hen's egg on branches of lumbar plexus	?	Necropsy	.....
Chiari[6]	1898	F, 22	Front of sacrum	?	?	?
Cripps and Williamson[7]	1899	F, 21	12.5 × 8 cm.; firmly attached to sacrum	Pain in iliac and lumbar area; irregular menses	Unable to remove *in toto;* severe bleeding; partial removal	Good; incomplete follow-up except for short period of time
Schorr[31]	1912	F, 18	Extended from lower pelvis retroperitoneally to hypochondrium	?	Removed; no details	No follow-up
McNaughton-Jones[27]	1912	F, 34	11 × 14 × 5 cm.; presacral area	.....	.....	.....
Parreira and Prates[29]	1934	F, 16	Pelvis (probably presacral)	Involved iliac vessels and pelvic nerves	Removed piecemeal; x-ray therapy	Incomplete follow-up
Adson[1]	1939	?, 5	Large size?	Chronic intestinal obstruction	Unremovable; biopsy and x-ray therapy	Incomplete follow-up
Lovelady and Dockerty[23]	1949	?, ...	Large size?	Chronic intestinal obstruction	Unremovable; involved obturator nerve and iliac vessels; x-ray therapy	Died 4 yr. after treatment
Lovelady and Dockerty[23]	1949	M, 30	Size?	?	Removed piecemeal; abdominal approach; involved obturator nerve and vessels	?
Toniolo[37]	1950	F, 4	Four presacral masses: two, 2.5 × 1.5 cm.; one, 9 × 6 cm.; one, 6 × 4 cm.	Asymptomatic	Abdominal operation; complete removal; base 3 cm.	No recurrence at end of 3 yr.
Steinberg[34]	1955	F, 4½	12 × 8.5 × 5.5 cm.; presacral	Asymptomatic	Abdominal operation; complete removal; small stalk	Successful; left sciatic pain
Rowe	1956	F, 3½	10 × 5 × 4.5 cm.; presacral	Apparent lumbosacral pain; soiling of underclothes; inability to establish bowel habit	Abdominosacral removal	Good; no recurrence after 2 yr.; enemas for bowel movement; no incontinence

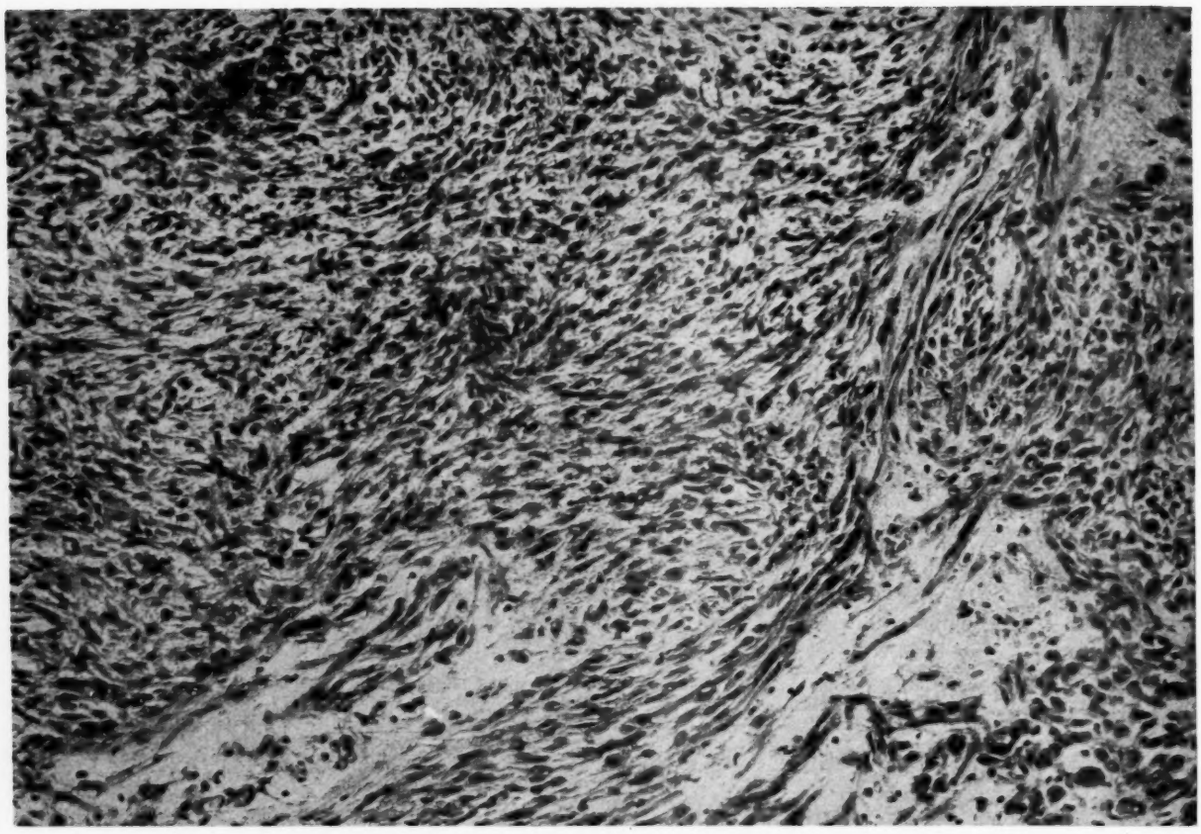


FIG. 5. Case 11. Photomicrograph demonstrating the spindle-shaped fibroblastic cells and marked anaplasia of this highly malignant fibrosarcoma.

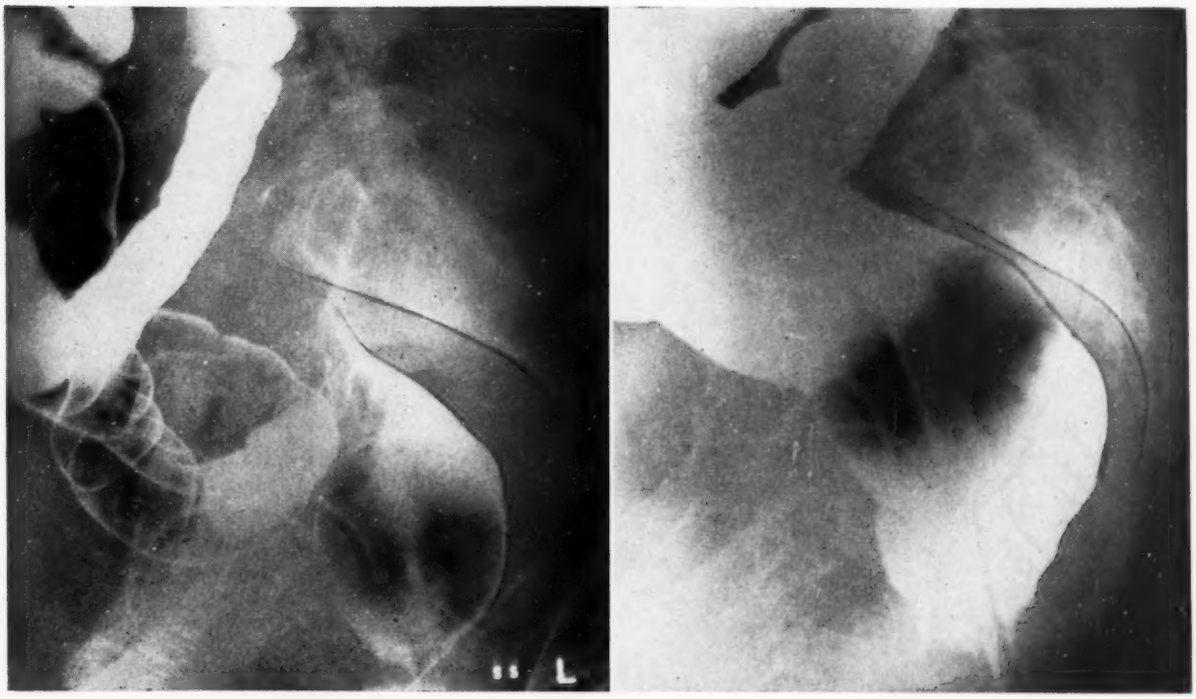
an uneventful recovery and was discharged on May 8, 1951, approximately twenty-seven days postoperatively.

The tumor mass measured 6 by 4 by 3.3 cm. It was surrounded by thickened and indurated connective tissue and was adherent to the attached bowel. It was encapsulated partially posteriorly. The diagnosis was primary fibrosarcoma, presacral area, grade III malignancy. (Fig. 5.)

The patient was followed up in the outpatient clinic and the perineal wound healed, but five months later on vaginal examination an extensive nodular infiltration was found in the vaginal wall on all sides. On September 22, 1951, a biopsy specimen was taken from one of the nodules and the diagnosis was fibrosarcoma. X-ray of the chest was reported as metastatic neoplasm in both lungs and in the eighth rib there was an associated pathologic fracture. Roentgenogram of the pelvis revealed areas of diminished bone density in the right and left ischia which probably represented early metastatic lesions. The remaining portion of the sacrum showed no evidence of bony involvement. On February 7, 1952, approximately ten months after resection of the rectum, the patient died at a convalescent home in a state of extreme cachexia and generalized local and distant metastases. Autopsy was not performed.

Fibrosarcomas are one of the most common sarcomas which arise in the wall of the rectum. Their occurrence in the presacral space is rare. The authors have been able to verify reports[3,19,36] of only three other cases of true presacral fibrosarcomas other than the one which has been reported herein. Retroperitoneal fibrosarcomas have been reported in only a few instances and according to Stout[36] none of these have been above the suspicion of being leiomyosarcomas, liposarcomas or some other type of tumor. Although fibrosarcomas are uncommon proctologic surgical problems, a knowledge of the pathologic and clinical behavior of these neoplasms is necessary for their proper treatment regardless of location. The subject has been dealt with extensively by Stout[36] and Pack.[28]

Fibrosarcomas usually develop spontaneously but in certain instances trauma has seemed to play an important role in their



6A 6B

FIG. 6. Case III. A, lateral view of rectum prior to radiation therapy. B, same view three months after treatment.

etiology. They have occurred in scar tissue, following radiation injury and at the site of former injuries frequently enough to establish definitely a relationship between trauma and the formation of these malignant lesions.

The symptomatology complex of the fibrosarcomas are of very little aid in their diagnosis. In inaccessible locations, such as the presacral area, symptoms usually are initiated by pressure when the neoplasm reaches an appreciable size. Since these tumors are usually of slow growth, pressure symptoms are not produced until the tumors are relatively large. As a general rule they appear to be encapsulated and usually can be shelled out from their beds. On a subsequent examination, however, the pathologists frequently find that the tumor has infiltrated through the capsule into the contiguous structures. For this reason it is inadvisable to dissect the tumor from its bed. When they arise from periosteum, the larger portion of the tumor protrudes into the soft tissues, as in the case reported by Stout[36] in which the tumor arose from the coccyx and protruded into the retrorectal area. In some instances pressure atrophy of the bone occurs although actual infiltration of the bone is not present.

The histologic appearance of fibrosarcomas has been described well by Stout[36] and Pack.[28] The microscopic picture goes from the well differentiated type to the more anaplastic, rapidly growing cellular tumor. (Fig. 5.) All degrees of differentiation from the benign to the extremely malignant type of neoplasm have been noted. The majority of the fibrosarcomas may be divided into two groups: those which are well differentiated and have a preponderance of reticulin fibers and those which have a more cellular form with fewer reticulin fibers. The clinical course of the fibrosarcomas follows the pattern which one would expect from the histologic appearance of the individual tumor. Fortunately, the more malignant, poorly differentiated and anaplastic fibrosarcomas comprise the smaller group of this type of neoplasm. Since the diagnosis of the fibrosarcomas usually is made from biopsy specimens, treatment is dependent upon their accurate histologic classification.

The highly malignant nature of certain fibrosarcomas is demonstrated in Case II. Ideally, it would have been advisable to have removed the segment of sacrum to which the tumor was attached. In view of the rapid, extensive, local and widespread recurrence this probably would have been futile. In an occa-

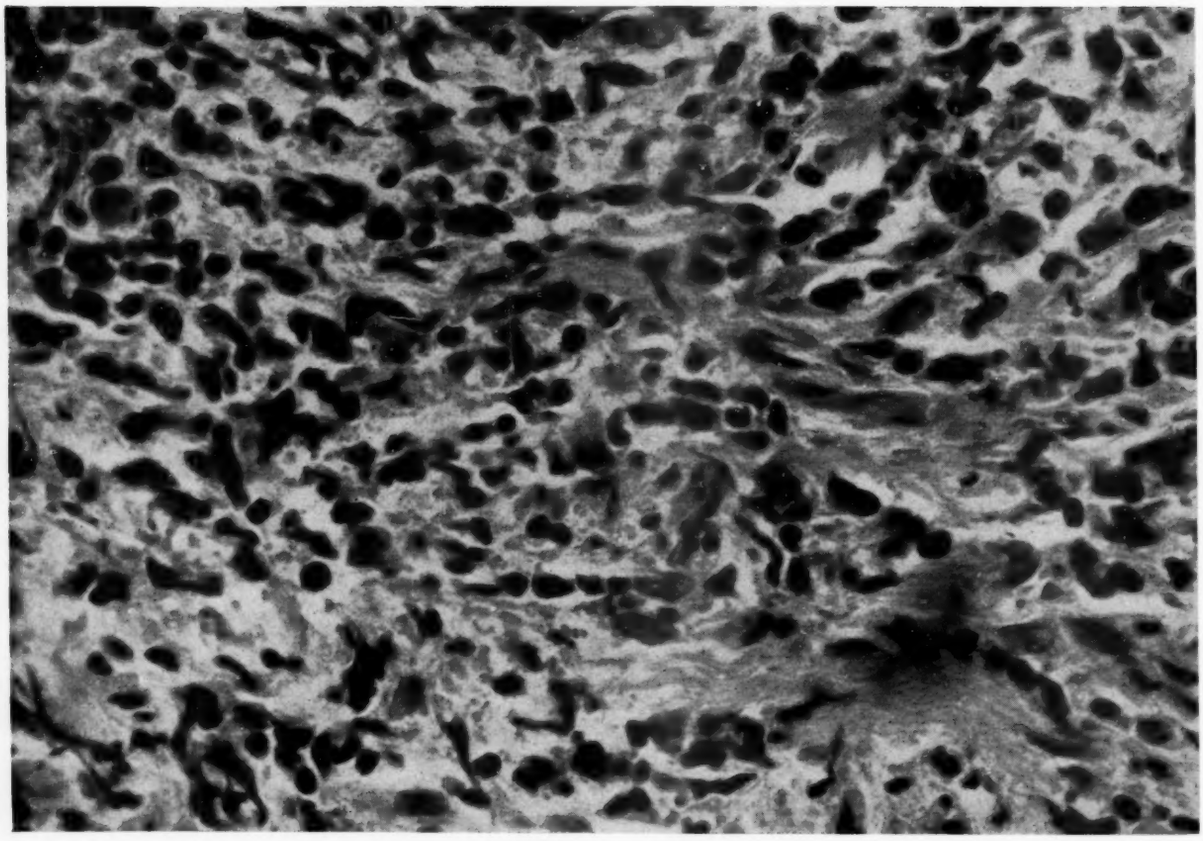


FIG. 7. Case III. Photomicrograph. Pleomorphic cellular content of Hodgkin's granuloma and the somewhat atypical Sternberg-Reed cells. Original magnification, × 560.

sional patient radiation therapy has appeared to be of value but almost without exception the fibrosarcomas are exceedingly resistant to radiation therapy. Even in the more benign types of fibrosarcoma which appear to be encapsulated, extra tissue should be removed on all sides of the tumor to prevent local recurrence. Stout[36] has estimated that 60 per cent of the soft tissue fibrosarcomas recur locally. Of course when the more anaplastic tumors are encountered, an even more radical approach is essential for cure.

HODGKIN'S GRANULOMA

CASE III. J. V. L., a thirty-two year old white man, was seen first on April 8, 1955, complaining of pain in the lower part of the back and aching in the posterior aspect of the thighs of two months' duration. He had lost approximately 15 pounds in weight. He had passed no blood from his rectum and had regular bowel movements. Orthopedic examination did not reveal any abnormalities. A neurosurgical consultant found no significant changes. The family history revealed that two members of his family had died from cancer of unknown type. General examination was essentially negative (no lymph nodes were palpable). A very vigorous digital examination revealed a smooth, firm, somewhat flattened protuberance from the upper sacrum, approximately 10 to 12 cm. from the anorectal outlet. Proctosigmoidoscopic examination was negative for 25 cm. with normal-appearing mucous membrane in the region of this mass. All the laboratory examinations were essentially normal. Lateral films of the rectum filled with barium revealed what appeared to be a separation of the rectum from the presacral area. (Fig. 6.) Otherwise, the barium enema was negative and there was no evidence of any bony involvement of the sacrum or coccyx.

On April 14, 1955, under spinal anesthesia, the patient was re-examined. On digital examination a definite presacral mass could be palpated. This appeared to involve the presacral region in front of sacral segments 2, 3 and 4. It was also slightly to the right of the midline. The rectal mucous membrane was freely movable over the tumor. A linear midline incision was made from the middle of the sacrum downward to the posterior perianal

margin. The incision was deepened to expose the sacral fascia, coccyx and portions of the glutei on each side. The coccyx was removed, the fascia divided, the levator muscles retracted and the retrorectal space was exposed. The rectum was freed by blunt dissection from the presacral area, and the lower border of a smooth, flattened, avascular appearing mass was exposed. Adequate biopsy specimens were taken from the tumor which was of rubbery consistency and only moderately vascular. The tumor was found to extend at least 6 to 7 cm. lateral to the sacrum on the left side and was flattened over its lower portion and densely adherent to the presacral fascia.

Grossly, the biopsy specimen consisted of four irregularly shaped bits of tissue, the largest of which was 0.9 by 0.9 by 0.4 cm. Microscopic sections (Fig. 7) revealed a cellular, proliferative lesion containing several different cell types. The diagnosis was Hodgkin's granuloma involving the presacral area. This was confirmed independently by two other pathologists. After consultation with our roentgenologist, the decision was made to treat this patient with deep x-ray therapy. A series of treatments was instituted. A 2,000 r tissue dose was delivered to the sacrum, hypogastric and iliac nodes during a two-week period. This was considered a limited radical approach for Hodgkin's disease involving this volume of tissue using 250 kilovolt potential-half value layer. About one month after treatment was completed the tumor had disappeared entirely. Barium enema studies at the end of two months revealed that the rectum had returned to a normal relation to the sacrum. (Fig. 6.) At the present time no tumor can be palpated and the patient is asymptomatic.

In 1832 Thomas Hodgkin[18] described seven cases in which generalized lymphadenopathy and splenomegaly were present. He also observed that this glandular enlargement appeared to be a primary affliction of these bodies. At least three of these original cases were characteristic of the disease which now bears his name. Subsequent to Hodgkin's original description much has been learned about this interesting disease which has so many characteristics of an inflammatory as well as a neoplastic process. The clinical and pathologic picture of Hodgkin's disease has been well defined but the actual etiologic agent is still unknown. In an excellent monograph on this subject Jackson and Parker[20] have recommended that Hodgkin's disease be divided into three types: paragranuloma, granuloma and sarcoma. They believe that it is essential to recognize the existence of these three forms of the disease because the pathologic picture, clinical aspects and prognosis differ materially with each of these forms.

Hodgkin's disease, fortunately, occurs infrequently. It accounts for approximately 0.25 per cent of deaths in a general hospital.[20] As far as the age incidence is concerned, it is primarily a disease of young adults but it may occur at any age. In a review of the available literature not one instance of localized presacral Hodgkin's disease could be found.

Hodgkin's paragranuloma appears to be a disease essentially of the lymph nodes. These are involved most frequently in the cervical region, are usually few in number, discrete, of rubbery consistency and do not become attached to themselves or the surrounding tissue. This is the more benign type of Hodgkin's disease and may remain relatively quiescent for years. On the other hand 20 per cent of these patients may progress to the true Hodgkin's granuloma type with a much poorer prognosis. Histologically, diagnosis is based on the presence of Sternberg-Reed cells as it is in all cases of Hodgkin's disease.

The granulomatous form of Hodgkin's disease is by far the most common. There are those who believe that this is definitely an inflammatory process and others who believe just as strongly that it is a malignant neoplasm. The symptomatology and signs of Hodgkin's granuloma are so varied that almost any other disease may be simulated or any system may appear to be involved. The course is extremely variable but usually progresses immeasurably to a fatal termination. It may appear to be confined to one area as in the case which is under discussion, but other nodes usually are involved. The histologic picture of Hodgkin's granuloma is characterized by the presence of Sternberg-Reed cells and by its great pleomorphorism.

The third type of Hodgkin's disease has been called Hodgkin's sarcoma and, in the opinion of most, has the characteristics of a true neoplasm. It is characterized by the presence of typical Sternberg-Reed cells scattered among cells that are probably extremely anaplastic forms of these cells, and behaves as a true tumor, is highly invasive and malignant, and may involve any organ of the body including the central nervous system proper.

In general, it may be stated that the treatment of choice for Hodgkin's disease is radiation

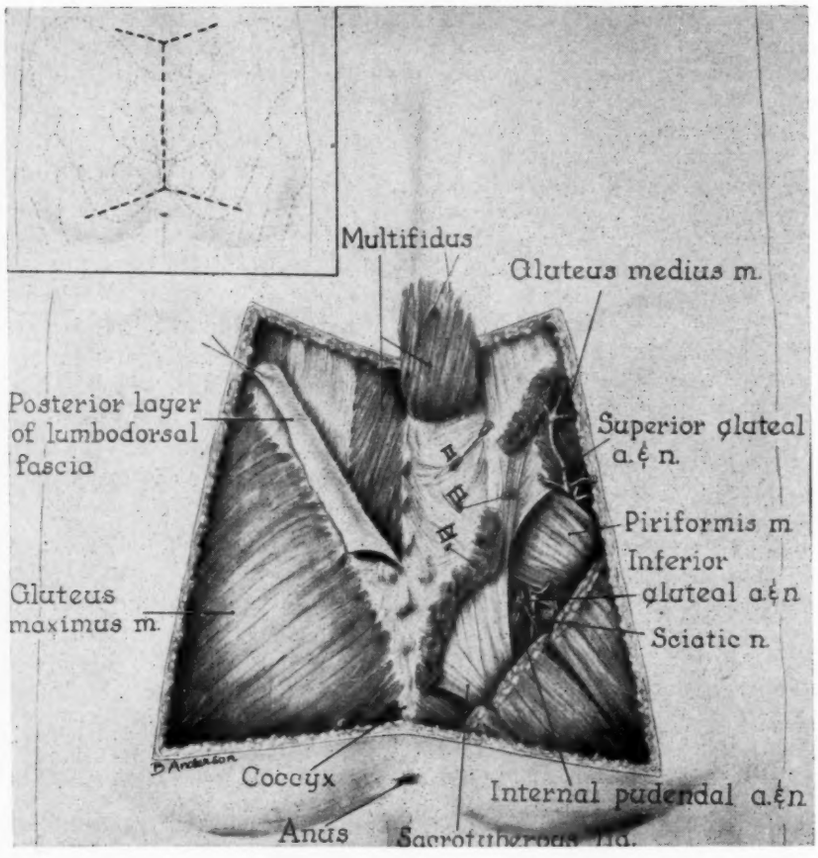


FIG. 8. Subcutaneous tissues have been removed and superficial structures partially detached from the sacrum. Needles have been inserted to identify the second, third and fourth foramens. Insert: Incision used in cadaver dissections. Longitudinal incision usually gives adequate exposure.

therapy. However, in some instances of the cervical paragranuloma and a few cases of localized granuloma, excellent results have been obtained by surgical excision. Fieber[11] recently surveyed the literature and found twenty-seven cases of Hodgkin's disease primarily involving the stomach. Ten of these patients survived five years after surgical resection. The treatment for the sarcomatous type is radiation therapy which is usually of no avail. Chemotherapeutic agents (nitrogen mustard, triethylmelamine and the corticosteroids) have been found recently to be of adjunctive value to radiation therapy. If this type of lesion is discovered early and appears to be localized, surgery occasionally is indicated. Undoubtedly, improvements in radiation technics have improved the outlook for patients with Hodgkin's disease. Following initial therapy patients should be observed carefully for the appearance of new lesions in order to institute therapy as early as possible.

SURGICAL MANAGEMENT

Several points of importance in the diagnosis of presacral tumors should be emphasized. A careful history with special reference to neurologic, bowel and bladder disturbances is extremely important preoperatively. Physical examination should include a thorough search for distant metastases, rectal and rectoabdominal palpation, proctosigmoidoscopy, roentgenograms of the bony pelvis and chest, barium enema and urologic studies. Retroperitoneal pneumography may be very helpful in their diagnosis as well as in determining the size and extent of the tumor. A barium enema should include lateral views of the rectum filled with barium. (Figs. 1, 2 and 6.) Sigmoidoscopy may be misleading since there is only displacement of the bowel and often no invasion. The importance of examination under anesthesia cannot be overemphasized. This was demonstrated in Cases I and III in which the diagnosis was not

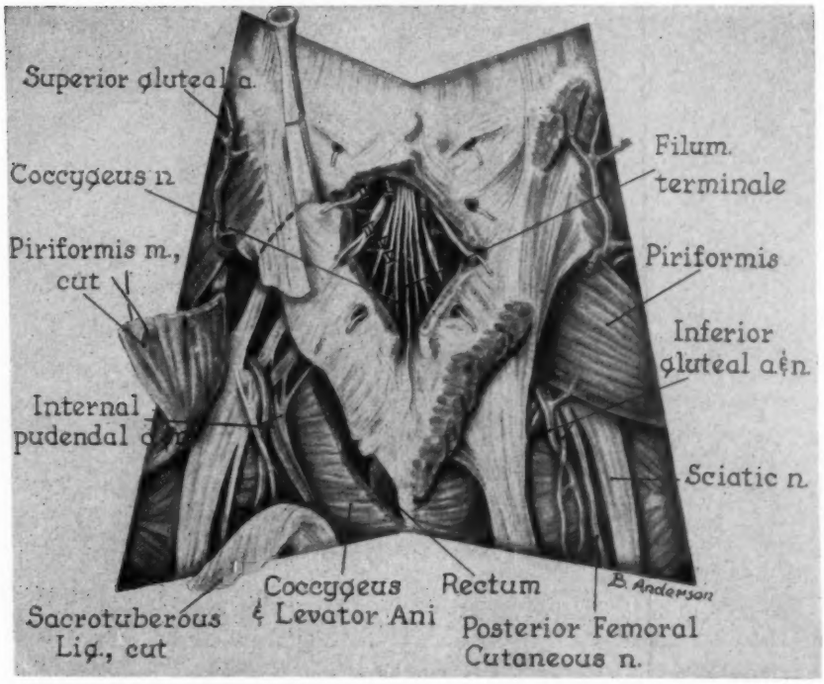


FIG. 9. Superficial structures partially detached from sacrum with the canal unroofed to expose the nerves. Transection of sacrum has been started at level of second sacral foramen on left side.

made until the patient was examined under anesthesia.

Before a patient is submitted to extensive surgery for a presacral neoplasm, the extent of the tumor and exact histologic diagnosis must be known since other methods of therapy besides surgery may be indicated (Case III). The procedure by which tissue is obtained for microscopic examination will depend upon the location of the tumor. Sufficient material can sometimes be obtained by needle biopsy although this method has not been uniformly satisfactory in obtaining adequate tissue for a final diagnosis. If the tumor is low and diagnostic biopsy alone is anticipated, an approach through the posterior ischiorectal and lateral sacral area may be made. The danger of cancer cell contamination must always be kept in mind in obtaining biopsy material but since an exact diagnosis must be made before definitive surgery is instituted, this danger must take a place of secondary importance. In the event that biopsy of the tumor entails a major surgical dissection, if the pathologist is confident of the diagnosis from frozen section and if the patient has been prepared for extensive surgery, removal of the tumor may be performed at the time of the biopsy (Case II). If there is any doubt as to the diagnosis, however, definitive surgery must await the results of permanent section diagnosis. Extensive or radical surgery should not be performed on the strength of frozen section examination alone unless the pathologist is unusually competent in this examination or absolutely confident of the diagnosis in a particular instance. The fallacy of depending too strongly upon this method for a final diagnosis was demonstrated in Case I.

In previous descriptions of the technics for removal of presacral tumors, the regional anatomy and important anatomic landmarks have been described inadequately. For clarification of these points the regional anatomy of this area was reviewed in several texts of anatomy and anesthesiology.[2,4,8,15,16,21] Four cadavers also were dissected in the anatomic laboratory. It is possible in this discussion to point out only the most important anatomic landmarks and additional points in technic which appear to be of practical value. These have been summarized in Figures 3, 8, 9 and 10 which depict the technic for exposing this area, identifying the important structures and removing the coccyx and lower portion of the sacrum. Perhaps the most practical anatomic descriptions of this area have been made by the anesthesiolo-

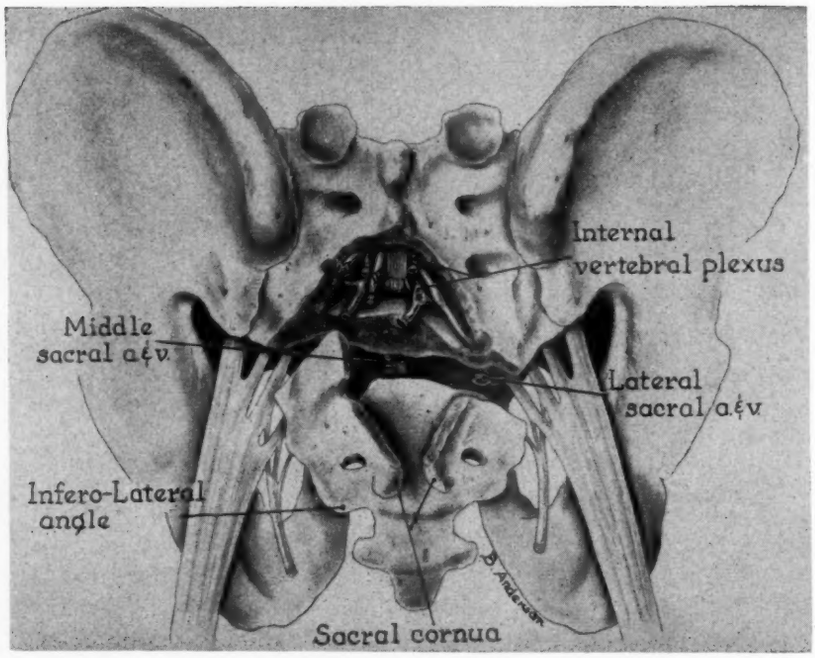


FIG. 10. Extent of resection that would have been necessary in Case 11 if the tumor had been malignant. Profuse vertebral plexus and anterior sacral vessels are demonstrated.

gists[4,21] who have become familiar with this area in administering sacrocaudal anesthesia. In the average adult the coccyx is approximately 5 cm. from the sacral hiatus which usually begins at the lower border of the fourth sacral segment and can be palpated except in the most obese patients. At the lower ends of its lateral boundaries are the sacral cornua. (Fig. 9.) Lateral to the cornua may be palpated the inferolateral angles of the sacrum. (Fig. 9.) The fourth sacral foramens are usually lateral to the upper boundary of the sacral hiatus. (Fig. 9.) In non-obese individuals the posterosuperior iliac spine, which is not actually the anatomic posterosuperior spine but the most posteromedial point of the iliac crest, can be identified by palpating the iliac crest posteriorly until contact is lost with the bone. The last point of contact is the anesthetic posterosuperior spine which is 1 cm. lateral and superior to the second sacral foramens. In the cadaver dissections these landmarks were relatively easy to find after the skin and subcutaneous tissues were reflected. After the second and fourth sacral foramens were located with spinal needles (Fig. 8), it was not difficult to place a needle into the third foramen. Although the sacral canal extends inferiorly through the sacral hiatus, below the lower border of the third sacral segment, the canal is flattened; and if it is unroofed at this point, it is very easy to injure the underlying nerves and veins. It is much easier to unroof the canal in the region of or above the third sacral spine. The first, second and third nerves can be identified very easily when the canal has been unroofed since they are usually much larger than the fourth and fifth nerves. By carefully cutting away the sacrum with a rongeur, the third nerve can be traced laterally out of the sacral canal and retracted, as Shackelford[32] has suggested. (In large individuals this is very difficult.) Although the dura usually ends at the lower border of the second sacral segment, it may extend to a lower level. If it is opened during removal of the sacrum, closure should be attempted. The structures which must be detached from the sacrum have been shown in Figures 8 and 9. Except for some sacral branches of the gluteal vessels, no large vessels will be encountered in detaching these structures from the coccyx and sacrum. Blood is supplied primarily to the sacrum by the middle sacral (aorta), lateral sacral (internal iliac) and the vertebral vessels. Many anatomic variations occur in this area, primarily in the conformation of the sacrum. These have been described comprehensively by Bonica.[4]

The technic for removal of a tumor in the presacral area will depend upon its size and the

extent of involvement of adjacent viscera or contiguous structures. A longitudinal midline incision extending from the lumbosacral area to the posterior perianal margin usually gives adequate exposure for extensive resections. A much shorter incision with or without removal of the coccyx will provide the exposure necessary for biopsy of lesions in this area. In the cadavers additional exposure was obtained by lateral extensions. (Fig. 8.) Benign (Case 1) or well encapsulated tumors, such as dermoid cysts or the fibrosarcoma reported by Bacon,[3] may not require removal of any of the sacrum unless additional exposure is necessary. If the tumor has involved the skin, the involved area should be left attached to the tumor. If the posterior surface of the sacrum is not involved, the next step is to clean off the subcutaneous tissues from the sacrum and the structures which are attached to it laterally. (Fig. 8.) The most important of these are the gluteus muscles, sacrotuberous and sacrospinous ligaments, piriformis and coccygeus muscles. Branches of the gluteal vessels may also require ligation. The anococcygeal muscular raphe and its ligamentous attachment are freed from the coccyx and, if it is not involved by the tumor, removal of the coccyx will give additional exposure. The retrorectal space is then entered, the muscles are retracted laterally and the rectum is separated from the sacrum and tumor mass anteriorly. Of course, if tumors invade the rectum (Case 11), it is necessary for that organ to be removed but extensive proximal removal of the bowel is not as necessary as it is when primary carcinoma of the bowel is present. Subsequent steps in the technic of the removal of the sacrum and tumor will depend upon the extent of its involvement and the size of the tumor. Certain important points should be emphasized. Sacral segments 4 and 5 and all of the coccyx may be removed with relative impunity and without any serious impairment of fecal or urinary incontinence. Above this level, however, the procedure is more difficult and hazardous, and it is extremely important to identify correctly the various sacral nerves in order to preserve fecal and urinary continence. The third nerve may be sacrificed unilaterally with only partial loss of fecal and urinary incontinence. Ideally, the upper three sacral nerves and the pudendal nerve should be preserved. Of course, when extremely large tumors are present and it is known preoperatively that the upper sacral segments will have to be sacrificed, exactitude is not as important in the surgical dissection. When a large tumor involves the upper sacrum, an abdominal approach may be necessary in order to control the blood flow to the tumor (Case 1). Permanent ligation of the internal iliac may be accomplished at laparotomy and is not injurious, but ligatures on the external iliac vessels should be placed so that they may be removed during the perineal phase of the operation. Bowers[5] and Hays[17] have proved the feasibility of removing all the sacrum except a small portion of the first sacral vertebra. The resulting fecal and urinary incontinence is difficult to manage but is compatible with life. MacCarty[24] and Shackelford[32] have also described technics which have been used in removing large tumors involving the mid- and lower sacrum. Closure of the wounds will depend upon the amount of dissection that has been necessary in removing the tumor and should follow recognized surgical principles.

SUMMARY

A case report of a large presacral ganglioneuroma in a three and a half year old female child has been presented. It was removed by a two-stage abdominoperineal approach. The patient has been free of recurrence for twenty-nine months. Only twelve similar cases have been reported in the literature. The majority of these tumors occur in patients under the age of twenty. They appear to have a congenital origin. Twenty-five per cent may have anaplastic changes and 18 per cent will metastasize. The benign types are cured by complete excision but frequently occur in such inaccessible locations that complete excision may be very difficult and mutilating.

The occurrence of a presacral fibrosarcoma in a sixty-seven year old white woman also has been reported. The majority of these neoplasms grow slowly and spread by direct extension, but the high degree of malignancy of certain fibrosarcomas was demonstrated in this patient. They are the most common of the soft tissue sarcomas but occur infrequently in the presacral area. Only three other cases of fibrosarcomas occurring in this location could be found in the literature. Sixty per cent recur locally but cure may be effected by a wide excision of tissue which includes a safe margin outside the capsule of the tumor.

A case of localized Hodgkin's disease of the presacral area has been reported. No other similar case could be found in the literature.

The presence of a tumor was detected by examination under anesthesia and lateral films of the rectum filled with barium. The histologic diagnosis was made from a biopsy specimen taken through a posterior approach after removal of the coccyx. The tumor disappeared rapidly under x-ray therapy.

A thorough history, examination under anesthesia, lateral views of the rectum filled with barium, roentgenograms of the bony pelvis, retroperitoneal pneumography and surgical exploration are important in the diagnosis of tumors in the presacral area. Location of the sacral cornua, sacral hiatus, inferolateral angles of the sacrum and the foramens is helpful in identifying the sacral segments prior to their removal. The use of needles in locating the foramens and the logic of unroofing the sacral canal for identification of the sacral nerves was confirmed by cadaver dissections. Extensive or vascular tumors may require an abdominoperineal technic to insure their radical removal and in order to control the blood supply to this area.

REFERENCES

1. Adson, A. W., Moersch, F. P. and Kemohan, J. W. Neurogenic tumors arising from the sacrum. *Arch. Neurol. & Psychiat.*, 41: 535, 1939.
2. Anson, B. J. Atlas of Human Anatomy, pp. 176, 230, 341–346, 401–403, 431, 437. Philadelphia, 1950. W. B. Saunders Co.
3. Bacon, H. E. Personal communication.
4. Bonica, J. The Management of Pain, pp. 350, 356, 528. Philadelphia, 1953. Lea & Febiger.
5. Bowers, R. F. Giant cell tumor of the sacrum: a case report. *Ann. Surg.*, 128: 1164, 1948.
6. Chiari. Discussion of Strauss Communication. *Centralbl. f. allg. Path. u. path. Anat.*, 9: 847, 1898.
7. Cripps, H. and Williamson, H. Retroperitoneal tumor connected with the sacral plexus. *Brit. M. J.*, 2: 10, 1899.
8. Cunningham, D. J. Manual of Practical Anatomy, 11th ed., vol. 1, pp. 232, 256; vol. 2, p. 444. Revised and edited by Brash, J. C. New York, 1948. Oxford University Press.
9. Cushing, H. and Wolbach, S. B. Transformation of malignant paravertebral sympathicoblastoma into a benign ganglioneuroma. *Am. J. Path.*, 3: 203, 1927.
10. Ewing, J. Neoplastic Diseases, 3rd ed., p. 405. Philadelphia, 1928. W. B. Saunders Co.
11. Fieber, S. S. Primary Hodgkin's disease of the stomach. *J. M. Soc. New Jersey*, 52: 76, 1955.
12. Genersch, A. Multiple neurome. *Virchow's. Arch. f. path. Anat.*, 49: 15, 1870.
13. Gentil, F. and Coley, B. L. Sacrococcygeal chordoma. *Ann. Surg.*, 127: 432, 1948.
14. Gerwig, W. H. Presacral cystic tumors. *Ann. Surg.*, 140: 81, 1954.
15. Grant, J. C. An Atlas of Anatomy, 3rd ed., pp. 470–472. Baltimore, 1951. Williams & Wilkins Co.
16. Gray, H. Anatomy of the Human Body, 25th ed., pp. 621, 623, 632, 986–988, 1228. Edited by C. M. Goss, Philadelphia, 1948. Lea & Febiger.
17. Hays, R. P. Resection of the sacrum for benign giant cell tumor. *Ann. Surg.*, 138: 115, 1953.
18. Hodgkin, T. On some marked appearances of absorbent glands and spleen. *M. chir., Tr. London*, 17: 68, 1832.
19. Jackman, R. J., Clark, P. L., III and Smith, N. D. Retrorectal tumors. *J. A. M. A.*, 145: 956, 1951.
20. Jackson, H. and Parker, F. Hodgkin's Disease and Allied Disorders. New York, 1947. Oxford University Press.
21. Labat, G. Regional Anesthesia, pp. 251–255, 262–286. Philadelphia, London, 1922. W. B. Saunders Co.
22. Littman, L. Sacrococcygeal chordoma. *Ann. Surg.*, 137: 80, 1953.
23. Lovelady, S. B. and Dockerty, M. B. Extragenital pelvic tumors in women. *Am. J. Obst. & Gynec.*, 58: 215, 1949.
24. MacCarty, C. S., Waugh, J. M., Mayo, C. W. and Coventry, M. B. The surgical treatment of presacral tumors: a combined problem. *Proc. Staff Meet., Mayo Clin.*, 27: 73, 1952.
25. Mayo, C. S., Baker, G. S. and Smith, L. R. Presacral tumors: differential diagnosis and report of a case. *Proc. Staff Meet., Mayo Clin.*, 28: 616, 1953.
26. McCarty, R. B. Presacral tumors. *Ann. Surg.*, 131: 424, 1950.
27. McNaughton-Jones, H. Case of ganglion neuroma of the mesentery. (Partly embryonic in structure.) *Proc. Roy. Soc. Med.*, 5: 287, 1912.
28. Pack, G. T. and Ariel, I. M. Fibrosarcoma of the soft somatic tissues. *Surgery*, 31: 1, 1952.
29. Parreira, H. and Prates, M. D. Dois cases de ganglioneuroma. *Arq. de. Pat.*, 6: 601, 1934.
30. Ross, S. T. Sacral and presacral tumors. *Am. J. Surg.*, 76: 687, 1948.
31. Schorr, G. W. Ganglioneurom des peripherischen Nerven Systems. *Centralbl. f. allg. path. u. path. Anat.*, 22: 91, 1912.
32. Shackelford, R. T. and Rhode, C. M. Sacrococcygeal chordoma. Its surgical treatment. *Ann. Surg.*, 141: 952, 1955.
33. Smith, R. W. Treatise on neuromata, 1849. Cited by Cripps, H. and Williamson, H.[7]
34. Steinberg, S. H. Presacral retroperitoneal ganglioneuroma in a 4½ year old child. Report of a case and review of the literature. *J. Pediat.*, 46: 562, 1955.
35. Stout, A. P. In: Atlas of Tumor Pathology, Section II, Fasicle 6, pp. 37–38. Washington, D. C., 1949. Armed Forces Institute of Pathology.
36. Stout, A. P. Fibrosarcoma. *Cancer*, 1: 30, 1948.
37. Toniolo, S. Su di un caso diganglioneuroms del piccolo bacino. *Arch. "de Vecchi" anat. pat.*, 14: 1165, 1950.

DISCUSSION

Hyrum R. Reichman (Salt Lake City, Utah): Among all the cases that I have encountered, I remember especially two patients with chordoma whom I saw and operated upon. I should like to use

them as the basis of discussion, particularly in view of the fact that Dr. Rowe has not encountered any patients with chordoma.

Any individual, in the course of his practice, will not see many presacral tumors; as has been pointed out, they occur only about once in 45,000 hospital admissions. Therefore, it becomes necessary for a group of this kind to summarize and pool its information so that we will be better able to recognize and treat these rarities which we will all eventually see as proctologists.

I operated on one of the aforementioned patients a little over six years ago and on the other, approximately seven months ago. As might well be expected they were both adult males, in whom the most common incidence of these tumors is noted. In both instances the patients had pain for a long period of time before the lesion was recognized. Both, peculiarly enough, were referred to me by orthopedists.

The first patient was operated on from below, at which time the coccyx and the fourth and fifth sacral segments were removed. In so far as was possible the tumor was removed via this route. The patient progressed well and his incision healed without difficulty.

For the past six years the patient has worked as a railroad engineer. He had urinary retention postoperatively which was treated by transurethral resection (as in the second case). He has done well, but has occasional incontinence. There is now a recurrence six years postoperatively, which seems to be common in this type of tumor, relentless in its growth and recurrence, and a second operation is necessary.

With this experience in mind, when the second patient appeared I was a little more anxious to perform, if possible, a more extensive operation. After a biopsy specimen had been taken I performed an abdominal operation, as these tumors will implant themselves frequently in the abdominal cavity, arising as they do from the notochord. They may be found anywhere along the vertebral column, but, as reported, about 50 per cent will be found in the sacrococcygeal area.

At this time I explored the tumor transperitoneally and there were no implants in the peritoneal cavity. I made no attempt to remove the tumor, fearing the implantation of cells within the abdominal cavity. The peritoneum was dissected free and attached more caudad on the bowel, and a loop colostomy made. At a second stage resection of the sacrum was performed and every effort made to remove all of the tumor. As far as we can determine, x-ray has little to offer for these patients.

This patient has made an uneventful recovery to this point and has returned to his occupation. Like the first patient, he had urinary retention and underwent transurethral resection, but to this time has had no other difficulty.

The authors have again emphasized very careful preservation of the nerves. As has been pointed out, if the first and second bilateral and the second and third unilateral presacral nerves can be preserved, it can be anticipated that there will be little trouble with urinary or fecal incontinence.

I would like to recapitulate what the authors have said, that it is very important to obtain a very careful history and make a very thorough physical examination. Do not fall into the trap of thinking that these tumors are a minor problem, for they are a major problem in every sense. Rectal examination is certainly most important. Digital examination is also important because visualization by the proctoscope will most generally reveal negative intraluminary findings except for the bulging posteriorly. We should make more use of roentgenology in the diagnosis of these problems, particularly of the various positions, as Drs. Rowe and Brock have pointed out.

I was very intrigued with the possibility of more information to be gained by pneumonography in this area. Also, before definitive treatment can be planned one must have a definitive pathologic diagnosis because these tumors are so variable in their pathology.

I am certain that the careful anatomic studies which have been presented are going to be very valuable to anyone confronted with this problem and to any surgeon contemplating treatment of these problems. The authors have indeed performed a great service to this Society by their encyclopedic study and by the scientific approach to the solution of these difficult surgical problems. By so doing they fulfill the purposes of this Society in accumulating, investigating and presenting the best available knowledge of proctologic problems and their solution to the medical profession as a whole.

WILLIAM J. MARTIN (Louisville, Ky.): Following this very interesting paper on presacral tumors, I thought some of you might like to have the opportunity of seeing an individual who had a presacral chordoma which was operated on just five years ago. I had one and I must say I am not happy to be the one in 46,000, the instance of occurrence as reported by Drs. Rowe and Brock, but I am very happy to be here and would like to relate to you my firsthand knowledge of this disease.

About two years previous to the discovery of my sacral tumor, I was fooling with a friend and fell backward over a rug, landing on my sacrococcygeal region, with the resulting symptoms with which all of you are familiar. I thought nothing of them for a good while, had definite periods when I was better and after some months symptoms had disappeared.

About a year later I attempted to sit on a chair "that wasn't there" and again fell on my sacrococcygeal region. This continued to hurt for about five months. I used all the treatments that either you or I would advise for one of our patients, but

I failed to have done what you or I would have had done to any patient who came to one of us with this complaint. I did not have a rectal examination, a sigmoidoscopic examination or an x-ray made until five months later.

I first went to an orthopedist who discovered a mass about 5 cm. in diameter in the presacral region. An x-ray showed erosion almost through the right side of the sacrum at the site of this mass.

My friends at home were very reticent to treat me so I went to the Mayo Clinic where two-thirds or more of my lower sacrum and coccyx were removed.

I was back in my office at work in three weeks, but soon the operative site became very uncomfortable and I realized that I had a hernia in the sacral region of the rectum protruding between what was left of the sacrum and the anal canal. This was indeed a most uncomfortable sensation. It exerted a pull in my upper abdomen and I even thought I could feel it in my esophagus; as if someone were dragging down on my gastrointestinal tract. There was a definite mass protruding and only if I backed up against something or pushed on this mass were my symptoms relieved. I could not have a bowel movement without an enema because I had nothing to push against. The exertion of straining to expel the stool increased the size of the mass in the sacral area. I tried all kind of braces and spent several hours each week in a brace shop trying to devise something that would exert pressure and replace the support that the sacrum gives to the rectum. This proved unsuccessful over a period of nine months. I had to strap myself so tightly around the pelvic girdle with the various types of braces that anesthesia in the distribution of the anterior crural nerves occurred. This became so intolerable that I finally decided to see if I could get the hernia repaired.

All this time I was having a great deal of difficulty voiding. Only by abdominal pressure could I void and I carried some residual a great deal of the time. Also, I could not have a bowel movement without an enema.

Ten months following my first operation the old wound was explored with the expectation of putting fascia lata or something else in to strengthen it. Fortunately, they found that two layers of the fascia which had retracted could be pulled together. In between the two layers of fascia, a thin layer of ivalon synthetic rubber tissue was inserted. Following this operation an indwelling catheter was inserted for two weeks. I had to take an enema to have a bowel movement; and after the catheter was removed, I never emptied my bladder fully (I do not believe that I do every time now). For over a year I was catheterized two to three times a week to be sure the residual was not too much for me to carry safely. Periodically I took a urinary antiseptic to aid this.

I still have to empty my bladder by abdominal pressure, but at times I am somewhat incontinent of urine.

The urinary disturbance, however, has not been any more disconcerting than has that of defecation. For three years I had to resort to an enema every day. Only in the past few months have I been able to overcome this and I am afraid that my straining has somewhat weakened the repair.

If any of you ever have to perform this operation, I plead with you to be sure that you give the greatest amount of support that you can to the sacral area to replace the removal of that most important bony structure against which the defecatory impulse is directed.

Raymond J. Jackman (Rochester, Minn.): We have taken transrectal needle biopsies of a few of these solid presacral tumors and we have not had any complications thus far. However, in our transrectal prostatic biopsies, one patient did have a great deal of extravasation of blood into the perineum. Further experience will probably bring forth more complications.

Although our experience is limited in this type of biopsy, I think it might have a place in solid presacral tumors in which a definitive diagnosis preoperatively is frequently very difficult.

Incidentally, we perform the procedure under caudal and sacral block anesthesia. We use one of the large Fansler type anoscopes, through which one can insert a finger and palpate the exact site of insertion of the Silverman needle.

Stuart T. Ross (Garden City, N. Y.): Two years ago I removed an 8 cm. neurilemmoma from the anterior sacrum and, to cover some of the sacral defect, we took fascia lata from the thigh and sutured it over the defect. Subsequently the fascia lata sloughed out, but the resulting scar tissue gave rather firm support to the defect.

Robert J. Rowe (closing): Within the past two years several five-year survivals have been reported. Dr. Brindley of Temple, Texas, recently reported a patient who had survived for more than ten years following removal of a chordoma. I believe he operated on that patient in 1943.

I did not go into much detail in regard to preservation of the nerves. It is extremely important to preserve the second, third and fourth if possible, but it is necessary to preserve the first, second and third for urinary and fecal continence. Dr. Martin probably had interference with the third on both sides. You can lose three on one side and still have a fair degree of continence.

The important factor in removing chordomas is complete excision of the tumor; if this is done, cure can be effected.

Recent Trends in the Treatment of Cancer of the Colon and Rectum

NEIL W. SWINTON, M.D., *Boston, Massachusetts*

From the Department of Surgery, the Labey Clinic, Boston, Massachusetts.

FOLLOWING the report by Miles almost fifty years ago on the lymphatic spread of cancer of the rectum and the development of the abdominoperineal resection for carcinoma in the terminal bowel, few technical advances were made in the treatment of rectal cancer until recently. There is now renewed interest in improving the end results of the surgical treatment of cancer of the colon and rectum and many significant reports are being made which are of interest to everyone treating this disease. Cancer of the colon and rectum spreads by four methods: lymph node invasion, blood vessel invasion, contiguity and direct implant. The majority of the recent articles have been concerned with these factors and may be grouped under the following headings: (1) increasing the amount of tissue removed and thus increasing the radicalism of the various operations, (2) preliminary ligation of the blood vessels to various areas of the colon and rectum as a means of increasing the radicalism of such procedures and of preventing the spread of tumor cells by manipulation of the tumor at the time of operation, (3) the reduction in the incidence of local recurrences, (4) the reduction in morbidity by the elimination of stage operations and abdominal colostomy, (5) the reduction in operative mortality, and (6) the improvement in survival rates.

At the clinic it has long been a policy when considering basic changes in the surgical treatment of any disease not only to study carefully such proposed changes but also to review accurately the results being obtained with our present methods of treatment. This is, perhaps, a conservative approach to the treatment of cancer but for us it has withstood the test of time in the past.

For this report a careful study has been made of the experiences of the clinic with the treatment of cancer of the colon and rectum during the years 1945 to 1949 inclusive,[1] and the recent literature has been reviewed. A brief analysis of this experience will be given and several of the more significant advances in the treatment of this condition which have been reported will be discussed.

TABLE 1
CANCER OF COLON AND RECTUM
LAHEY CLINIC—1945 TO 1949 INCLUSIVE

	No.	Per cent
Patients treated*	901	.....
Operations performed	901	100
Resections performed	837	93
Palliative procedures performed	168	20
Deaths	51	5.6
Follow-up	891	99
Survivals	386	43

* One hundred fifty additional patients seen had primary treatment elsewhere. Eight additional patients seen refused treatment at clinic.

During this five-year period 901 patients with cancer of the colon and rectum were treated at the clinic. (Table 1.) The clinical findings associated with this series have been reported previously. The operability rate was 100 per cent and the resectability rate 93 per cent, of which 168 patients, or 20 per cent, were considered to have palliative procedures. The mortality rate for the 901 patients was 5.6 per cent. A follow-up was obtained in 99 per cent of the series. An absolute survival rate of 43 per cent was obtained. In the palliative group it was found that 36 per cent of the patients survived more than two years.

In the surgical treatment of cancer of the colon and rectum the best possible end results will be obtained if the resection involves an adequate amount of bowel and the widest possible resection of the adjacent mesentery and lymph nodes. Many of the series reported in the literature on this subject have been primarily concerned with the blood supply of the colon, as the amount of colon and mesentery which may be safely resected is closely related to the blood supply of the remaining bowel.

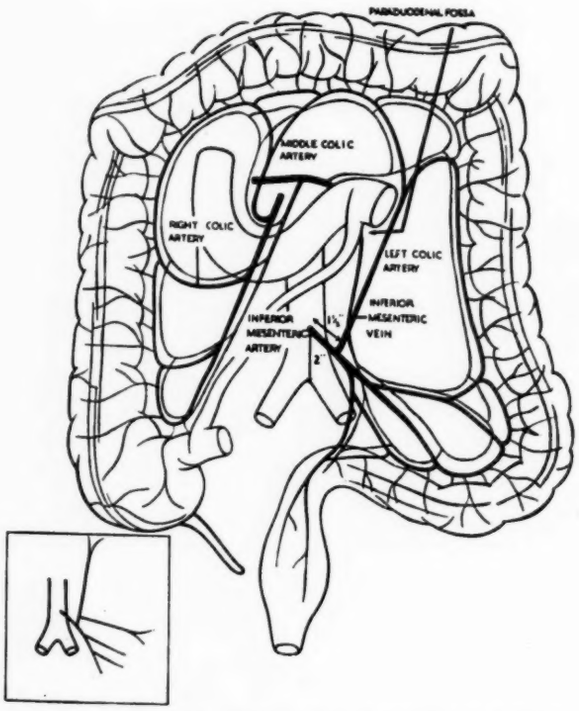


FIG. 1. Blood supply of the colon. Anastomosis between left and middle colic arteries has been found to be absent in a small number of patients. (From: MORGAN, C. N. *J. Roy. Coll. Surgeons, Edinburgh*, 1: 112–125, 1955.)

Morgan's[2] concept of the blood supply to the colon is shown in Figure 1. Braithwaite[3] has given us an excellent discussion of the results of the interruption of the inferior mesenteric artery and its branches. The works of Ault et al.,[4] Castro,[5] Goligher,[6] Snellman,[7] Waite,[8] and Grinnell and Hiatt[9] are well known. There can be no question that the most radical operations for cancer of the colon and rectum would be done if all surgeons performing these procedures were familiar with these anatomic considerations. We must all realize that there will be individual variations in the blood supply of a small percentage of these patients, however, and it is essential that the extent of each resection be determined for each patient by the limitations of the blood supply apparent in that patient prior to the resection.

Another important technical factor in resections of the colon and rectum is the reduction in blood loss resulting from the preliminary ligation of the blood supply to the resected parts. Abel[10] and Bacon[11] have recently brought to our attention that in addition to the preliminary ligation of the inferior mesenteric vessels in removal of the rectum, preliminary ligation of the hypogastric artery is also advantageous.

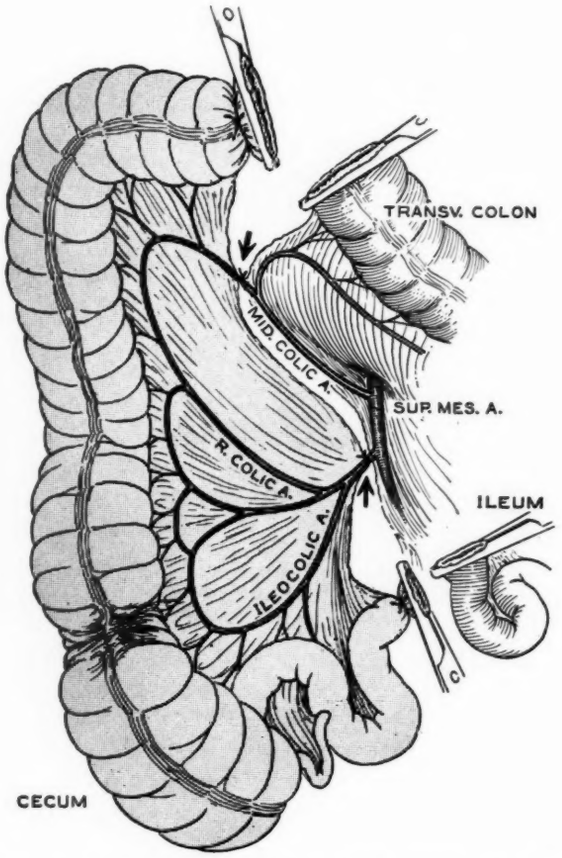


FIG. 2. Preliminary ligation of blood supply of right colon.

Ault, Bacon[12,13] and Waite have emphasized the frequent occurrence of metastases to the lymph nodes in the region of the inferior mesenteric trunk in the preaortic lymph nodes, and for some time they have dissected these lymph nodes at the time of the removal of

malignant tumors in the distal sigmoid and rectum.

At the clinic we believe that the preliminary ligation of the blood supply to any area of the colon which is being removed is advantageous and should be done. In obese patients we have encountered technical difficulties in doing this in the right colon and do not believe that it is mandatory if it adds materially to the operative procedure. (Fig. 2.) We are not as yet convinced that the routine dissection of the preaortic nodes will materially improve our survival rates. At times it does add to the technical difficulties of the operation, but we have had a very limited experience with this and believe that the results of those surgeons who are following this procedure should be closely observed in the future.

Closely related to this subject have been the articles that have dealt with preliminary vessel ligation as a means of preventing the spread of tumor cells through the blood vessels by manipulation of the tumor at the time of operation. Dukes[14,15] has reported blood vessel invasion in 17 per cent of the primary tumors in patients with rectal cancer and slightly less in those with cancer of the colon. Grinnell[16] noted blood vessel invasion in 36 per cent of patients with rectal cancer and 33 per cent of those with cancer of the colon. Brown and Warren,[17] in an autopsy series, reported an incidence of blood vessel invasion of 61 per cent in patients with rectal cancer. In our series 28 per cent of our resected specimens showed that the blood vessels had been invaded by the tumor at the time of resection.

In addition, Cole et al.[18] have called our attention to the possible significance of the presence of tumor cells in blood vessels adjacent to the tumor recovered at operation and presumably due to manipulation of the tumor. Fisher and Turnbull[19] have recovered tumor cells from the major venous channels in 32 per cent of twenty-five cases. In an additional eighty cases in which preliminary vessel ligation was done and the tumor was not manipulated this incidence had fallen to 5 per cent.[20] Adamson, in our group, has duplicated Turnbull's figures in a series of fifty patients.

In spite of these provocative reports on the frequency and significance of blood vessel invasion both in the resected specimens and in adjacent blood vessels at the time of operation, we do not believe that the full significance of these findings is as yet apparent. In our series the survival rate of those patients with blood vessel invasion in the resected tumor did not differ from the absolute survival rate of the entire series and was not as significant as was the presence or absence of lymph node invasion in removed specimens.

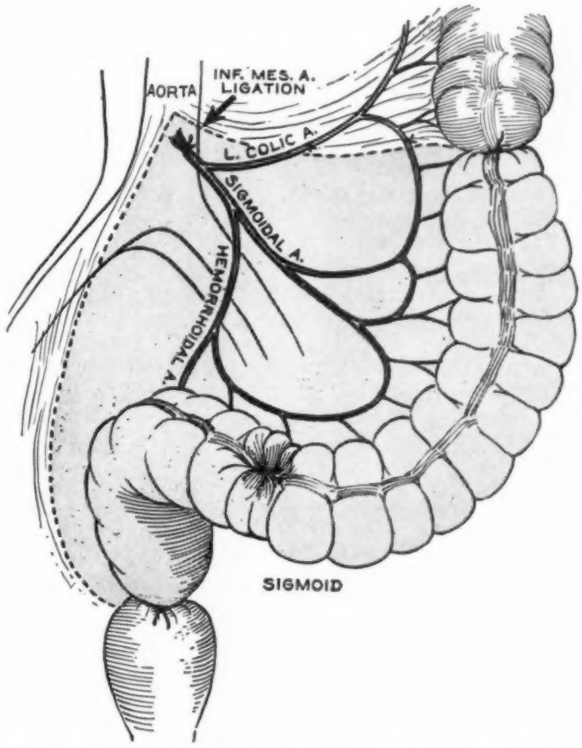


FIG. 3. Ligation of inferior mesenteric vessels and ligation of lumen of left colon above and below lesion.

It is our impression that early blood vessel invasion in a resected tumor specimen is a characteristic of the inherent nature of that tumor, whereas lymph node invasion is more an index of the age of the tumor. It is well known that certain malignant tumors, from their inherent nature, shed tumor cells into adjacent vessels frequently and in large numbers. The vast majority of these cells are destroyed by the natural defense mechanisms of the body. Why on occasion distant metastases occur in certain patients is not known and whether the manipulation of a tumor at operation is a factor in increasing such metastases, although sound in theory, has yet to be proved.

Another group of reports has dealt with the reduction in the incidence of local recurrences. Cole, Goligher, Dukes and Bussey[21] and others

have discussed this problem in detail. There is no question that tumor cells can be recovered from the lumen of the bowel adjacent to the tumor at the time of operation in a high percentage of cases; also, there can be local recurrences from these tumor cells when implanted on raw surfaces.

TABLE II
TYPE OF OPERATION PERFORMED

	No. of Cases	Per cent
Cancer of the rectosigmoid, rectum and anus:	702	
Miles' resection	590	84.0
Anterior resection	69	9.8
Other	43	6.1
Cancer of the colon:	199	
Primary resection	101	50.7
Mikulicz operation	67	33.7
Other	31	15.6

We have adopted Cole's suggestion of ligation of the lumen of the bowel in the majority of our cases. (Fig. 3.)

Dukes, Morgan and the group from St. Mark's have shown that irrigation of the rectal stump distal to a clamp in patients with carcinoma of the low sigmoid and upper rectum with a 1:500 solution of bichloride of mercury has reduced the number of recurrences at the suture line following anterior resections. We are in agreement that this is an excellent principle to be followed, but we question the specific lethal effect of this strength of a bichloride solution and wonder if the important factor is not the mechanical irrigation.

There is not much to add to the generally accepted attitude at this time that stage operations in treatment of cancer of the colon and rectum are not necessary except as emergency procedures. Our series represents the transition period in the gradual elimination of stage operations. The operations employed by us during 1945 to 1949 are illustrated in Table II. The Mikulicz type of resection has now been abandoned. The Lahey two-stage operation for cancer of the rectum had been abandoned prior to 1945.

There is, however, at this time, a lack of agreement on the place of the so-called anterior resection for lesions of the low sigmoid and upper rectum and the pull-through operation as advocated by Bacon[22] and Waugh[23,24] for lesions in the middle and upper rectum.

We believe at present that anterior resection is suitable for those patients with lesions above the peritoneal reflection when there is no marked extrarectal spread and the bowel can be safely resected for a distance of 3 inches, as measured before resection, or 1 inch in the removed specimen below the tumor. At present, slightly over 20 per cent of our patients with cancer of the colon and rectum have an anterior resection.

It is difficult for us to criticize the pull-through type of operation for cancer of the rectum as we have not had any experience with it. In the past we have not believed that this was as radical an operation as the classic Miles procedure and would not give as good survival rates; also, that it was technically more difficult than the abdominoperineal operation. Elimination of the abdominal colostomy has not seemed to us significant if either of these two previous factors were true.

The most recent survival rates and operative mortality reported by both Bacon and Waugh, however, are comparable to those following the Miles procedure and may lead us to revise our thinking in the future on this subject.

The problem of operative mortality will always exist, as Foster so ably described the problem of postoperative infection in our recent symposium. In our series the operative mortality was 5.6 per cent, a figure with which we are not satisfied. It probably is not unreasonable in view of our high resectability rate, but certainly it can be improved. Since our preliminary report was made on this series, a committee from our medical department has made a critical review of our fifty-one fatalities and has slightly revised our previously reported statistics and made several constructive suggestions which will be reported elsewhere.

The causes of death in this series as reviewed by this committee are given in Tables III and IV. Approximately one-third of the deaths were due to infection. This factor can and already has been materially lessened. The prompt recognition and the immediate and energetic treatment of postoperative infections, as was pointed out in our recent symposium, should reduce this factor to a minimum.

Pulmonary emboli remain a serious problem to us. One-third of our patients died from pulmonary emboli. One-half of these deaths occurred during the first five postoperative days, a period when in the past we have hesitated to use anticoagulant therapy. We do not at present know the answer to this problem. It may be that ligation of the inferior vena cava may be the only method of preventing this fatal complication in certain carefully selected cases. This operation, however, is one which we generally have not favored.

TABLE III
PRIMARY CAUSE OF DEATH

Pulmonary embolus	18
Peritonitis	18
Cause unknown	3
Coronary sclerotic heart disease	3
Shock:	
Surgical	2
Postoperative hemorrhage	1
Pneumonia, aspiration	2
Pneumonia, right upper lobe	1
Carcinomatosis	1
Intestinal obstruction, unrelieved	1
Transfusion reaction, renal failure	1
	51

TABLE IV
CONTRIBUTORY FACTORS TO DEATH

Intestinal obstruction (or ileus)	17
Electrolyte and fluid imbalance	10
Evisceration	7
Pulmonary atelectasis	4

The average age of the patients in our series was fifty-seven years. Age, in relation to mortality factors, has received considerable attention in the literature. Crile and Turnbull[25] have recently adopted an attitude favoring conservative treatment for patients of advanced years with cancer of the colon and rectum. We are not in agreement with this attitude but favor the arguments of Gilchrist and de Peyster,[26] and Moyer and Key[27] and do not believe that age in itself is an important factor in operative mortality. There certainly is no evidence in our studies to justify palliative operations in patients of advanced years who otherwise are in good health.

The end results obtained in our series are given in Table v. The recently reported end results by Grinnell,[28] Gabriel,[29] Morgan, David and Gilchrist,[30] Bacon and Waugh have also been reviewed. It is difficult, if not impossible, to compare these results without a prolonged discussion, time for which is not available in this report. It is unfortunate that cancer statistics are not reported in a more uniform manner, yet detail is essential if all the truth is to be learned from them. These large series recently reported suggest an increasing improvement in survival rates. We believe that this is due to a variety of factors, a number of which have been mentioned in this discussion, although the true significance of some of the recent reports is yet to be established. We must never overlook the fact that although these technical advances have probably improved our survival and operative mortality rates, the discovery and destruction of polyps as a precancerous lesion and the definitive treatment of these patients earlier than has been the case in the past remain the most significant factors in further improving our end results.

TABLE V
END RESULTS

Involvement	Total Series*		Five-Year Survival†	
	No.	(%)	No.	(%)
No involvement	412	45.7	254	61.6
Lymph node involvement	194	21.5	59	30.4
Lymph node and blood vessel involvement	126	14.0	33	26.1
Blood vessel involvement	95	10.5	40	42.1
Nodal or vessel involvement, or both	415	46.0	132	31.8

* Includes 93 per cent of 901 patients or 827 resected specimens.

† Four hundred eighty-three patients of 901 in series (43 per cent) survived for five years.

It is our impression, although difficult to prove, from a review of these end results that there is remarkably little difference in the end results obtained by experienced surgeons even though quite different principles were followed by many. Perhaps the most significant advances in the future in the treatment of cancer of the colon and rectum will come from our laboratories and result from a better understanding of the inherent characteristics of these tumors.

There are many other phases of this subject which might be discussed, namely, the optimal resectability rate for patients with cancer of

the rectum and the colon and the place of palliative procedures, among others. Turner[31] has given us a theoretic resectability rate for cure of 68 per cent for the colon and 58 per cent for the rectum, based on an extensive autopsy experience. There is every reason to maintain a high resectability rate in this disease since it has been shown to be such a favorable lesion and it is so well recognized that many patients can be given relief and comfort by palliative operations. The American Proctologic Society is pledged to the advancement of knowledge of diseases of the colon, rectum and anus. The members of this organization have made outstanding contributions in our fight against cancer of the bowel in the past. It can only be hoped that this organization will continue to be the spearhead in promoting further advances in this field.

SUMMARY AND CONCLUSIONS

A report has been made of the five-year experience from 1945 to 1949 inclusive of 901 patients with cancer of the colon and rectum treated at the Lahey Clinic. In this series the operability rate was 100 per cent, the resectability rate 93 per cent and the operative mortality 5.6 per cent. The absolute survival rate of the 901 patients receiving primary treatment at the clinic was 43 per cent. Palliative operations were performed on 20 per cent of the patients and 36 per cent of these patients survived more than two years.

Some of the recent reports which have been made suggesting modifications and improvements in past technics have been discussed. These reports have been grouped under six headings: (1) increasing the amount of tissue removed, thus increasing the radicalism of the various operations, (2) preliminary ligation of the blood vessels to various areas of the colon and rectum as a means of increasing the radicalism of such procedures and of preventing the spread of tumor cells by manipulation of the tumor at the time of operation, (3) the reduction in the incidence of local recurrences, (4) the reduction in morbidity by the elimination of stage operations and abdominal colostomy, (5) the reduction in operative mortality, and (6) the improvement in survival rates.

It is our belief that the preliminary ligation of blood vessels, both as a means of increasing the radicalism of such procedures and of preventing further spread of the tumor by manipulation at the time of operation, are distinct advances and should be employed. There can be no question that the elimination of viable cancer cells in the lumen of the bowel which may cause local recurrences by implants on raw surfaces is a most important factor and should be thoroughly appreciated. There is general agreement that stage operations at present have little place in surgery on the colon and rectum except as emergency situations develop. The control of infection and possible further advances that can be made in the control of pulmonary emboli are most important problems in the further reduction of operative mortality. Our survey of recently reported survival rates indicates that some improvement is being made in the number of patients surviving surgical treatment of cancer of the colon and rectum. It is regretted, however, that more uniform statistics are not being used which could offer better basis for comparison of different technics.

Finally, it is suggested that in the future the most important developments will come from the laboratory and will involve a better understanding of the inherent nature of this disease.

REFERENCES

1. Swinton, N. W. and Counts, R. L. Cancer of colon and rectum: a statistical study with end-results. *J. A. M. A.*, 161: 1139–1142, 1956.
2. Morgan, C. N. Trends in the treatment of tumours of the rectum, rectosigmoid and left colon. *J. Roy. Coll. Surgeons, Edinburgh*, 1: 112–125, 1955.
3. Braithwaite, J. L. The results of interruption of the inferior mesenteric artery and its branches in the rhesus monkey. *Surg., Gynec. & Obst.*, 102: 331–338, 1956.
4. Ault, G. W., Castro, A. F. and Smith, R. S. Carcinoma of the upper rectum and rectosigmoid; clinical report on high inferior mesenteric ligation. *Postgrad. Med.*, 8: 176–183, 1950.
5. Castro, A. F. Surgical technique of ligation of inferior mesenteric artery and preaortic lymphadenectomy. *Surg., Gynec. & Obst.*, 102: 374–376, 1956.
6. Goligher, J. C. Blood-supply to sigmoid colon and rectum, with reference to technique of rectal resection with restoration of continuity. *Brit. J. Surg.*, 37: 157–162, 1949.
7. Snellman, B. High ligation of inferior mesenteric artery in operations for carcinoma of left colon, and rectum. *Acta chir. Scandinav.*, 105: 364–375, 1953.
8. Waite, V. C. Extending the zone of resection for carcinoma of the rectum and sigmoid. *Surgery*, 33: 702–711, 1953.
9. Grinnell, R. S. and Hiatt, R. B. Ligation of inferior mesenteric artery at the aorta in resce-

tions for carcinoma of sigmoid and rectum. *Surg., Gynec. & Obst.*, 94: 526–534, 1952.
10. ABEL, L. Personal communication.
11. BACON, H. E. Personal communication.
12. BACON, H. E. and TRIMPI, H. D. Rectal cancer; inferior mesenteric regional lymph node dissection with ligation of inferior mesenteric artery at its aortic origin; report of two hundred sixty-one cases. *West. J. Surg.*, 63: 181–184, 1955.
13. MCELWAIN, J. W., BACON, H. E. and TRIMPI, H. D. Lymph node metastases: experience with aortic ligation of inferior mesentery artery in cancer of rectum. *Surgery*, 35: 513–531, 1954.
14. DUKES, C. W. Surgical pathology of rectal cancer: president's address. *Proc. Roy. Soc. Med.*, 37: 131–144, 1944.
15. DUKES, C. W. and BUSSEY, H. J. R. Venous spread in rectal cancer. *Proc. Roy. Soc. Med.*, 34: 571–573, 1941.
16. GRINNELL, R. S. The spread of carcinoma of the colon and rectum. *Cancer*, 3: 641–652, 1950.
17. BROWN, C. E. and WARREN, S. Visceral metastasis from rectal carcinoma. *Surg., Gynec. & Obst.*, 66: 611–621, 1938.
18. COLE, W. H., PACKARD, D. and SOUTHWICK, H. W. Carcinoma of the colon with special reference to prevention of recurrence. *J. A. M. A.*, 155: 1549–1553, 1954.
19. FISHER, E. R. and TURNBULL, R. B., JR. The cytologic demonstration and significance of tumor cells in the mesenteric venous blood in patients with colorectal carcinoma. *Surg., Gynec. & Obst.*, 100: 102–108, 1955.
20. TURNBULL, R. B., JR. Personal communication.
21. GOLIGHER, J. C., DUKES, C. E. and BUSSEY, H. J. R. Local recurrences after sphincter-saving excisions for carcinoma of rectum and rectosigmoid. *Brit. J. Surg.*, 39: 199–211, 1951.
22. BACON, H. E. Abdominoperineal proctosigmoidectomy with sphincter preservation. *J. A. M. A.*, 160: 628–634, 1956.
23. WAUGH, J. M., MILLER, E. M. and KURZWEG, F. T. Abdominoperineal resection with sphincter preservation for carcinoma of the midrectum. *Arch. Surg.*, 68: 469–485, 1954.
24. WAUGH, J. M., BLOCK, M. A. and GAGE, R. P. Three and five-year survivals following combined abdominoperineal resection, abdominoperineal resection with sphincter preservation, and anterior resection for carcinoma of the rectum and lower part of the sigmoid colon. *Ann. Surg.*, 142: 752–757, 1955.
25. CRILE, G. H. and TURNBULL, R. B., JR. Personal communication.
26. GILCHRIST, R. K. and DE PEYSTER, F. A. Principles and safeguards in abdominal surgery of aged. *J. A. M. A.*, 160: 1375–1379, 1956.
27. MOYER, C. A. and KEY, J. A. Estimation of operative risk in 1955. *J. A. M. A.*, 160: 853–855, 1956.
28. GRINNELL, R. S. Results in the treatment of carcinoma of the colon and rectum. *Surg., Gynec. & Obst.*, 96: 31–42, 1953.
29. GABRIEL, W. Personal communication.
30. DAVID, V. C. and GILCHRIST, R. K. Abdominoperineal removal of low lying cancer of the rectum; 5 year cures and local recurrences. *Surg., Gynec. & Obst.*, 89: 31–36, 1949.
31. TURNER, J. W. Observations on neoplastic spread: some radiologic aspects of the problem. *New England J. Med.*, 249: 507–514, 1953.

DISCUSSION

HARRY E. BACON (Philadelphia, Pa.): It is a pleasure to discuss this excellent paper by Dr. Swinton not only because of the representative series reported but also the thought-provoking problems entailed.

Experience has evidenced the fact that the aggressive and extended approach for pathologic processes of the large bowel, including diverticulitis, non-specific ulcerative colitis, benign tumors and particularly malignancy, possesses definite merit. Long term rates of survival will attest the verity of this statement. It is gratifying that Dr. Swinton and his surgical confreres have discarded percentagewise the staged or graded procedures routinely. During the past eight years we have seldom found it necessary to employ the multiple stage procedure, such as the Mikulicz, but one should never relegate this time-honored maneuver to the limbo of the forgotten past because an occasion may arise when it can be well chosen to a patient's advantage.

Regarding the "pull-through" operation, I believe that this procedure, which I reported on quite recently in detail together with its five- and ten-year rates of survival, can stand on its own merit and requires no further remarks. The author states that he performed abdominal colostomy on 84 per cent of patients with lesions of the rectosigmoid and rectum. In my opinion that is entirely too high a percentage.

For a few years we have been interested in the lymphatic mode of spread. In particular I have been displeased with my own attempts to dissect the node-bearing areas in relation to the superior mesenteric vessels for malignant lesions of the right and transverse colon. For lesions of the left colon, sigmoid and rectum, however, abdominopelvic lymphadenectomy with concomitant ligation of the inferior mesenteric artery at the aortic origin offers promise. To date we have performed this procedure on 343 patients, and of those reported by McElwain and later Valiente in our department, 19.3 per cent showed positive nodes in the region of the aortic origin. McElwain found that 60 per cent of the general regional nodes were involved in the specimens cleared by the Spaltehotz-Gilchrist technic, compared to the 37 per cent which I reported in 1949 in uncleared specimens.

Dr. Swinton has cited fifty-one operative deaths of which nineteen, or 35.2 per cent, were due to pulmonary embolism. In a personal series of 1,302 resections, we had forty-nine deaths, or a mortality

of 3.7 per cent. Nine of these were due to pulmonary embolism, an incidence of 18.3 per cent. This, also, is admittedly too high. However, I cannot share the enthusiasm of those who would recommend prophylactic vena caval ligation as a routine procedure in light of the experimental data presently available. It is true that in part the results have been encouraging, and the recent investigation of Dale and Bauer with absorbable intestine offers promise; yet, the institution of a procedure (even though technically simple) which carries with it troublesome postoperative sequelae cannot be accepted too enthusiastically. Bowers, of Memphis, reported complications such as leg edema, pain, ulceration and weakness in 60 to 70 per cent of his cases; they were of a serious nature in 34 per cent. To confine a patient to bed, particularly an aged person, for ten to fourteen days or beyond the twenty-four-hour postoperative period, would turn back the table of surgical progress by two decades.

RAYMOND J. CONNORS (Fall River, Mass.): Despite the excellence of this paper and the advances cited therein we should realize that we are only offering the populace the results of our ignorance.

EDWARD D. PARKINSON (Boise, Ida.): I wonder if Dr. Swinton would say a few more words about ligation of the hypogastric artery and the point at which the artery is ligated. In what percentage of patients is this done?

NEIL W. SWINTON (closing): I am appreciative of Dr. Bacon's remarks. Although perhaps we disagree on one or two points, I am sure we agree in general on this subject.

I do not wish to give the impression that we are favoring ligation of the inferior vena cava. We have not done any ligations. I brought the point up because in several discussions on how to decrease our rate of pulmonary emboli we have considered ligation. The next time I operate on a patient with a huge cancer in the pelvis and have to perform a difficult procedure, producing an unusual amount of trauma to the deep pelvic veins, I may consider the procedure mentioned.

I know that the emboli these patients have do not always arise from the deep veins of the legs. There are many that arise from the large veins in the pelvis. I think it is a mechanical problem, as evidenced by the fact that in half of our patients it occurred in the first five days. I do not know the answer to it.

I want to say one word about statistics. I did not have time to go into this further, but we reported an absolute survival rate of 43 per cent which was based on the fact that 901 patients came to us with this disease. We operated on every patient; resection was performed on 93 per cent, and 386 of these patients could walk into our office, as of January 1st.

I become confused when studying other people's statistics. It is impossible to obtain comparative figures from the literature in most instances and it is regrettable that more of us do not report statistics of this type in a comparative manner.

Some writers eliminate the patients who die. Some eliminate those patients who were not followed up, and some report on those patients who died from diseases other than cancer; the latter is very dangerous unless autopsy has been performed.

In our own series I worked up a chart for my own use. (This chart is not included in the paper.) If one takes advantage of all these factors, the survival rate in our series can be increased from 43 to almost 70 per cent.

In answer to Dr. Parkinson's question about ligation of the hypogastric artery, my experience consists of three cases. Apparently I have been about fifteen years behind in that problem because the first time I realized it could be done safely was about a month ago when I saw Lawrence Abel, in London, perform an abdominoperineal resection. He does this operation very much as we do. He dissects down from the bifurcation of the aorta and proceeds down the iliacs. The first branch is the internal iliac or hypogastric, and about 2 cm. below its origin he ligates this vessel with a catgut ligature.

I have talked with our urologists and others and I have found no one who believes this can do any harm. In my series of three cases it not only has cut down the blood supply to the tumor area but also apparently has decreased the blood supply to the perineum.

I discussed this with Dr. Bacon a few days ago and he said, "I have been doing that for at least three years." Ligation of the hypogastric artery can be accomplished safely as far as I know.

Perineal Hernia Following Abdominoperineal Resection

HAROLD E. HULLSIEK, M.D., *St. Paul, Minnesota*

THE case I wish to present is that of a fifty-six year old man in whom a postoperative perineal hernia developed following an abdominoperineal resection for carcinoma.

This patient came to me in September, 1953, because of bleeding and frequent stools. A narrowed anal outlet prevented a competent digital examination but a small caliber proctoscope showed a nodular tumor just below the rectosigmoid junction. A biopsy specimen proved it to be an adenocarcinoma. Sulfathalidine® was administered for five days and neomycin for twenty-four hours. On October 24th a one-stage abdominoperineal resection was performed.

The patient's recovery was uneventful. He was seen from time to time in my office and at the end of six weeks the posterior wound was healed. In July, 1954, eight months after operation, he began to complain of vague discomfort in the perineum. He was examined in the Sims position and the posterior area was found to be quite soft and not tender. Because of his insistence that something was amiss the patient was seen in consultation by a surgeon who also examined him in the Sims position and could find no cause for his complaints. At the time neither of us thought of a perineal hernia.

I saw the patient again in January, 1955, when he was still complaining, not of a pain but of "something going on" in the perineum. He had been deer hunting the month before and had walked 8 or 10 miles a day and wondered whether this had anything to do with his discomfort.

It was not until April, 1955, almost a year after his first complaint of perineal discomfort, that I examined him while he was standing as I should have done in the beginning. On so doing I could feel a soft, fluctuant bulge beneath the posterior scar. When the patient was placed on the table in the inverted position, the bulge became a concavity.

He was sent to a roentgenologist with a tentative diagnosis of perineal hernia, with the request that he be given barium by mouth and a determination made of his small bowel level. The x-ray report read: "Herniation of several loops of small bowel through the perineum, apparently in the operative site." (Fig. 1.) This patient had no obstructive symptoms and except for the complaint of mild discomfort in the perineum he was extremely well.

FIG. 1. Hernia in Case 1.

On April 15, 1955, eighteen months after his operation and twelve months after his first complaint, the hernial repair was made. On opening the abdomen, we were gratified to find no recurrence of the tumor. In the center of the pelvic floor an opening approximately 1½ inches in diameter was seen, containing a single loop of small intestine. This was firmly adherent at one side and at the bottom, and was separated with difficulty because of the narrowness of the pocket; however,

this was finally accomplished without tearing into the bowel. The peritoneum was freed at the edges and the opening easily closed with catgut sutures. A stab wound was made from below into the space and a Penrose drain inserted.

The patient left the hospital at the end of eight days after an uneventful convalescence. The repair was made in April, 1955, and in October, 1955, an x-ray of the small bowel showed no recurrence. His last x-ray was in February, 1956, and showed no recurrence.

In reviewing the literature on perineal hernia if one does not make the distinction between that and perineal hernia with the added qualifying term "postoperative," he will find himself up a number of blind alleys. In a discussion headed "Perineal Hernia," Koontz states that it is the rarest of all hernias except sciatic, and mentions the various types according to their frequency as follows: internal, obturator, lumbar, perineal and sciatic.

Koontz[4] also mentions Hall's[5] work in 1938 in which eighty-three cases of perineal hernia culled from the literature are listed. Koontz's patient, however, did not have a postoperative perineal hernia and as far as can be determined from a reading of Hall's article, the hernias he mentions were what he called vaginal hernias.

Under the title "Levator Hernia" Frank Yeomans[1] in 1937 described a case of hernia following resection of the rectum, and in the same report discussed the anatomic considerations of levator hernia, with subheads, perineal and pudendal.

Garlock and Backst[3] state that a pudendal hernia may originate anterior or posterior to the broad ligament, and descend to the pudendal region where it is bounded by a triangular space consisting of the ischiocavernosus muscle laterally, the bulbocavernosus medially and the transversus perinei posteriorly. This latter muscle, the authors state, is an important landmark in differentiating a pudendal from a perineal hernia. Here again this so-called perineal hernia is not the type under discussion.

Cattell and Cunningham[2] were possibly the first to use the term postoperative perineal hernia. It seems an established fact that the types of hernia grouped under the general heading of perineal hernia make up a very small group, and that possibly postoperative perineal hernia is still more rare. I say possibly since these hernias may occur more often than heretofore believed or than is borne out by a search of the literature. Harrold[10] says, "Considering the trauma involved perineal hernia following abdominoperineal resection is surprisingly rare."

Cattell and Cunningham's patient was a female in whom a hernia developed eight years after a two-stage Lahey resection. Repair was made from below and there was no recurrence one month after the repair. The coccyx was removed at the original operation, a point referred to later.

In McKenny's[8] patient, also a female, a hernia developed three months after a one-stage abdominoperineal operation. At the time the case was reported the hernia had been repaired from below but had recurred.

Hayden[6] mentions two cases, both following one-stage resections and both occurring within a year of operation. Neither patient had a repair.

T. E. Jones[7] reports a postoperative perineal hernia, the only one encountered in 300 abdominoperineal operations. This hernia occurred nine months after operation and was not repaired.

In Yeoman's patient, a female, a hernia developed four months after perineal proctectomy. This was repaired from above and nine months later showed no evidence of recurrence.

Cattell believed that the removal of the coccyx is an important factor in the production of postoperative perineal hernia. In his case (1944) the coccyx had been removed, although he had discontinued this procedure in abdominoperineal resections ten years previously. In none of my patients was the coccyx removed. Certainly the removal of the coccyx adds somewhat to the discomfort of the patient and is almost never necessary.

At the Lahey Clinic, Cattell encountered one postoperative perineal hernia in 800 patients on whom resections were performed for carcinoma. Many of these patients must have had the coccyx removed. It seems to me inconclusive to attribute the hernia in the one case to removal of the coccyx, although Cattell makes a good case for it.

I believe that on the completion of the perineal phase of the operation the packing of the posterior cavity with a long roller of folded gauze placed inside a plastic sheet or rubber dam is of value, and such has been my practice. In this way the pelvic diaphragm is supported in more or less its proper position for the first

FIG. 2. Normal small bowel level after abdominoperineal resection.

FIG. 3. Case II (No. 23 in series).

FIG. 4. Case III (No. 27 in series).

forty-eight or seventy-two hours. Very shortly the peritoneal floor becomes stiffened with edema and exudate and its resistance to the downward thrust of the abdominal contents is increased. If the roller is carefully placed inside the plastic sheet, it is easily removed without an anesthetic and never with more than momentary discomfort.

It is indeed a mystery why, if these hernias occur at all, they do not occur more often. There is a possibility that they occur more frequently than we have believed in those patients who neglect to report or in whom, as was nearly so in my case, it is not recognized. With this in mind I have been making a series of x-ray studies of the small bowel level in patients who have had abdominoperineal resections. (Fig. 2.) It is a tedious undertaking since many patients cannot be located, some fail to respond to letters, some are loathe to have x-rays, and many acquiesce but take an interminable time before they report for examination. The time lapse since the original operation in my patients varies from six months to fifteen years.

Thus far I have examined, by means of x-ray, forty-one patients on whom I have performed abdominoperineal operations.

Quite unexpectedly, in Case 23 in the series the roentgenogram showed a well developed postoperative perineal hernia. (Fig. 3.) This forty-eight year old woman had been operated upon nine months before and has absolutely no symptoms. Case 27 also illustrates a hernia. (Fig. 4.) The patient is seventy-four years old and was operated upon in 1945. She lives out of the city and I did not see her at the time of the x-ray examination. I do not know at this time whether or not she has symptoms as I have not seen her for several years. Neither of these two patients had a hysterectomy. Thus, in forty-one patients studied, thirty-eight have been proved by x-ray to have no hernias, while three definitely have. Therefore instead of two cases in 1,900 operations, citing T. E. Jones, D. F. Jones[9] and Cattell, we find three cases of hernia in these forty-one patients studied.

I submit this in the hope that others may extend the scope of these investigations of small bowel levels following abdominoperineal resections, and eventually we may be able to clear up the question of how often this condition actually occurs. D. F. Jones states that he did not encounter a postoperative perineal hernia in 800 resections, but does he know that none occurred among the 800 patients? I think that with the cooperation of the American Proctologic Society we may find out.

SUMMARY

Six cases of postoperative perineal hernia from the literature are mentioned and three personal cases are added. A means of investigation of these patients is mentioned and a hope expressed that these studies will be continued by the members of the Society.

Acknowledgment: An expression of appreciation is due Drs. Richard Aurelius and Donald Peterson, roentgenologists, who generously contributed material and time to these studies.

REFERENCES

1. YEOMANS, F. C. Levator hernia. *Tr. Am. Proct. Soc.*, p. 132, 1937.
2. CATTELL, R. B. and CUNNINGHAM, R. M. Post-operative perineal hernia following resection of rectum. *S. Clin. North America*, 24: 679, 1944.
3. GARLOCK, J. H. and BAKST, A. A. Pudendal hernia. *J. Mt. Sinai Hosp.*, 17: 457, 1951.
4. KOONTZ, A. R. Perineal hernia. *Ann. Surg.*, 133: 255, 1951.
5. HALL, W. E. B. Vaginal hernia. *Arch. Surg.*, 37: 651, 1938.
6. HAYDEN, E. P. Discussion. *Tr. Am. Proct. Soc.*, pp. 137–138, 1937.
7. JONES, T. E. Discussion. *Tr. Am. Proct. Soc.*, p. 138, 1937.
8. MCKENNY, D. C. Discussion. *Tr. Am. Proct. Soc.*, pp. 135–136, 1937.
9. JONES, D. F. Cited by Hayden, E. P.[6]
10. HARROLD, T. Perineal hernia; report of case occurring in male. *Ann. Surg.*, 127: 1086, 1948.

Anorectoplasty: Complications and Final Results

WILLIAM A. MCMAHON, M.D., *Seattle, Washington*

THE purpose of this paper is to present the incidence of complications and final results obtained in a series of 853 patients on whom an amputative type of anorectoplasty was performed. This series was taken from my own practice over a period of five years. Institutional cases and those that were not followed up in my own office are not included.

Dissatisfaction with results obtained by the established clamp and ligature procedures, along with my own acceptance of the essential part that structures in the crypt-bearing area play in the pathogenesis of anorectal disease, was responsible for a change to an amputative operation with ablation of the entire crypt area.

The series to be presented comprises 853 patients on whom surgery was performed for the basic problem of hemorrhoids. In an analysis of these cases, other anorectal disorders were found in 94.3 per cent. (Table I.)

The operative procedure employed had as its objective the removal of hemorrhoids and all diseased portions of the anus and rectum. To accomplish this aim, an amputative anorectoplasty was performed in which the entire hemorrhoidal area was dissected free, including skin tags, external hemorrhoids, anal crypts and papillae, areas of scar associated with fissure, internal hemorrhoids, and redundant mucosa of the anal canal and lower rectal ampulla. The dissection was carried upward to a point where normal mucosa could be brought down and anastomosed to the skin after amputation of the diseased tissues. This anastomosis was made without tension and was fixed at the normal level of the pectinate line on the medial aspect of the internal sphincter.

The primary aim in the postoperative period was to obtain a normal-formed stool in order to accomplish daily physiologic dilation of the anal canal and sphincter elements. No manual dilation was believed to be necessary aside from gentle exploration of the anal canal with a small cotton applicator.

TABLE I

	Percentage	No. of Cases
Prolapse	49.1	418
Fissure	27.8	237
Cryptitis	20.7	176
Fistula	14.1	120
Pectenosis or stenosis	8.1	69
Papillae	7.0	60
Thrombosis	7.0	60
Polyps	5.2	44
Abscess	2.8	24

These patients were seen at intervals postoperatively until such time as healing was complete and the functional result was considered normal. The average length of time comprising this period of observation was about three months.

COMPLICATIONS

In the analysis of the postoperative complications and sequelae, the occurrence of urinary retention was not considered as being related to the operative procedure employed. Postoperative pain was not formidable and hence no special measures such as local anesthesia or prolonged use of narcotics were employed. Table II illustrates the complications encountered in their order of frequency.

Impaction. Impaction occurred in 143 patients, or 16.8 per cent. This was found most often one week following surgery. The condition responded to simple enemas in all patients

except one. Here digital removal under anesthesia was necessary.

Stenosis. The diagnosis of postoperative stenosis requiring surgical correction was made in nineteen patients, or 2.2 per cent. A narrowing of the stools to pencil size was commonly noted in the first month postoperatively. During this period the first digital examination was done to explore the line of anastomosis, still relying on the formed stools and physiologic softening of the scar to accomplish restoration of the caliber of the bowel to normal. In the nineteen patients in whom contraction of the outlet persisted and showed no sign of improvement, simple sphincterotomy was performed.

TABLE II

Complication	No. of Cases	Percentage
Impaction	143	16.8
Stenosis	19	2.2
Atony of sphincter (temporary, responded to exercise)	13	1.5
Fistula	10	1.1
Fissure	5	0.6
Thrombosis	4	0.5
Abscess	3	0.4
Altered sensation (temporary)	3	0.4
Postoperative hemorrhage (one patient had leukemia)	3	0.4
Ectropion (partial)	2	0.2

Atony. Atony of the sphincter was noted in thirteen patients, or 1.5 per cent. This was a temporary condition and in most patients it followed the correction of conditions involving more than the usual degree of prolapse. The condition responded quickly to sphincter exercise in all cases.

Fistula. Postoperative fistula occurred in ten patients, or 1.1 per cent. In five of the ten patients there was a pre-existing fistula, two of which were of the rectovaginal type. The other five postoperative fistulas occurred independently of previous fistula formation.

Fissure. Postoperative fissure occurred in five patients, or 0.6 per cent. Two of these patients had anal fissure as an associated diagnosis at the time of surgery. The shortest duration of these fissures was two weeks and the longest eleven months, but all healed spontaneously. This is significant since the complete removal of the anal crypts accomplished by this amputative procedure may be the deciding factor. Certainly the clinical course bore very little resemblance to the usual type of anal fissure.

Thrombosis. Thrombosis of external hemorrhoidal vessels was noted postoperatively in four patients, or 0.5 per cent. This can hardly be considered an operative complication but is included for completeness. It gives evidence of incomplete removal of the external hemorrhoidal vessels in these patients.

Abscess. Abscess formation occurred in three patients, or 0.4 per cent. These were simple abscesses having their origin at the line of anastomosis and were not followed by fistula formation. Simple incision and drainage resulted in uneventful healing.

Altered Sensation. Altered sensation occurred postoperatively in three patients, or 0.4 per cent. It was not uncommon to find that some patients had difficulty in differentiating flatus from stool during the immediate postoperative period; however, in all but these three patients normal sensation had returned at the end of two to four weeks. In the aforementioned patients some changes in perception continued for as long as six months but eventually disappeared.

Postoperative Hemorrhage. Post operative hemorrhage occurred in three patients, or 0.4 per cent. In one of these complete avulsion of the line of anastomosis occurred on the seventh postoperative day. This patient had chronic myelogenous leukemia and surgery had been undertaken for the control of severe bleeding from large prolapsing hemorrhoidal masses. Healing was delayed, but eventually was complete.

Ectropion. This condition occurred in two patients, or 0.2 per cent. It resulted from fixation of the anastomosis between skin and mucous membrane at too low a level. While in both instances only a segment of the circumference was involved, the defects were productive of symptoms and were corrected by subsequent surgery.

SUMMARY

An analysis of the complications encountered after an amputative type of anorectoplasty have been presented. In the series of 853 cases complications occurred in 24.1 per cent. This seems to be an extremely high rate

of complications until it is further qualified by noting that fully two-thirds come under the heading of postoperative impactions. Since this series was compiled, the routine use of aerosol O. T. by mouth in the postoperative period has reduced the incidence of impactions to a minimum, certainly under 1 per cent.

In reviewing this series, the complications encountered do not seem to warrant the intense criticism which has been directed toward all Whitehead type amputative procedures.

A consideration of the final results of the corrective surgical procedure used on this group of patients reveals that they have normal function and are free from anorectal disease at the present writing. It can be estimated that future anorectal disease is not liable to develop since no recurrences have been encountered.

It is my hope that a study will be carried out on a comparable series of patients undergoing the more conventional clamp and ligature procedures so that further comparisons may be made of these two widely divergent approaches to the correction of anorectal disorders.

DISCUSSION

Robert E. Pumphrey (Dayton, Ohio): I cannot share Dr. McMahon's enthusiasm for the use of an amputative type of hemorrhoidectomy as a routine procedure. There can be no doubt that such an extensive procedure results in more postoperative morbidity in terms of patient discomfort and disability. It would therefore seem desirable to reserve the amputative type of hemorrhoidectomy for the more severe cases involving the entire anorectal ring.

The statistics presented by Dr. McMahon indicate a good response to the procedure when viewed in the light of his explanatory notes. However, several of the complications such as postoperative impaction, stenosis and fistula seem much more frequent than would be anticipated if more conservative surgery were practiced.

My own experience with the amputative method has not been as trouble-free as Dr. McMahon has indicated, especially in regard to altered sensation, stenosis and ectropion. There seems to be a great difference in patient response to any given procedure and it is not always possible to regulate the bowel movements to the proper consistency, nor is it possible to predict how a patient will progress following an operation. Any deviation from the normal in the postoperative course of the patient is very likely to result in a complication if the amputative method has been used.

The importance of the crypt-bearing area cannot be denied and is recognized by all proctologists as a potential source of disease. Nonetheless, I would not advocate sacrificing so much tissue if it means an appreciable increased morbidity any more than I would advocate hysterectomy because a fibroid might later develop in the uterus.

Richard A. Hopping (East Orange, N. J.): I would like to mention one glaring omission in Dr. McMahon's list of complications. Very often tags in the perianal skin occur following this type of procedure, and I am wondering if he discounts these as a complication.

Emil Granet (New York, N. Y.): Although I have not compiled my own series in detail, I can report on approximately 500 anorectoplasties probably similar in technic to the type that Dr. McMahon performs.

I also find that the most frequent complication in the immediate postoperative period is impaction. Whether the type of impaction that my patients experience can really be called a specific complication of anorectoplasty is questionable. I find that in patients who have had a simple ligature type of operation, impactions occur in about the same proportion.

Stricture occurred infrequently in my patients, much less than the 2.2 per cent reported by Dr. McMahon. This was so perhaps because of my use of partial posterior myotomy in all patients who presented a fibrotic anal canal (pecten band) when examined digitally following induction of anesthesia. In patients with chronic anal fissure (ulcer), inflammatory fibrosis below the ulcer often extends deeply into the internal sphincter muscle so that a good portion of that muscle must be sacrificed in order to attain cure.

Some of my patients, perhaps 5 per cent, do complain of incontinence to very soft stools and to flatus in the immediate postoperative period. Partial incontinence often persists until the wound is healing well and the patient is not afraid to contract the sphincter muscles, a period of two to three weeks.

A point of great importance which I would like to emphasize is that the functional and anatomic end result in any type of anorectoplasty requires the lapse of a prolonged period of time in order for physiologic changes to take place in the wound. Scar tissue does soften in the anorectal region provided nature is given time to accomplish this.

Dr. McMahon has emphasized the importance of dilatation by the natural movement of the bowels through the anal canal. I agree with him that manual dilatation is not necessary. I believe it to be harmful in most patients following anorectal surgery, because with dilatation trauma is produced, thereby increasing the proliferation of fibrotic tissue. Eventually more stricture is present than if the wound had merely been explored with the little finger.

WILLIAM A. MCMAHON (closing): In regard to Dr. Pumphrey's question about the difficulty of controlling the patient's bowel habits, I would call attention to the fact that a complete appraisal of each individual is, of course, of the greatest importance, particularly regarding the bowel habits of the past. Those patients with any semblance of an irritable bowel or any combination of symptoms which suggest the condition are treated during the postoperative period by dietary measures, antispasmodics and mild sedation as might be required.

In answer to Dr. Hopping's question, I can sincerely state that there are no tags with this type of procedure.

I might mention one more thing about the reduction of impactions. Aerosal O. T. performs amazingly. I have been using it for about six months. As you know, it is simply a wetting agent and has no action whatsoever on the bowel, but does prevent dehydration of the stool. I have given patients straight aerosol O. T. 1% in doses of 1 gm. twice a day for the past six months and have noted no impactions.

The Diagnosis of Schistosomiasis Mansoni by Sigmoidoscopy and Transparency Biopsy of the Rectal Mucous Membrane

BENJAMIN W. WARNER, M.D., *New York, New York*

SCHISTOSOMIASIS mansoni (intestinal Bilharzia—blood or liver fluke worm) is a serious parasitic disease of the portal, mesenteric and pelvic venous systems which is endemic in Puerto Rico. The large shift of population from the island to the mainland of the United States makes an awareness and knowledge of this disease an urgent problem.

The pathogenesis of the disease in man is directly related to the peculiar life cycle of the worm.[1,2] The cycle is maintained by the passage of eggs with a lateral spine from the human host in feces and urine contaminating water harboring appropriate species of snail. Upon contact with water the eggs are hatched, releasing a free-swimming ciliated larva called a miracidium which enters the visceral mass of the snail where marked multiplication occurs. In about four weeks the parasite emerges from the snail as a forked-tail, self-propelled cercaria and seeks to penetrate the skin or buccal mucous membrane of the host exposed in infected water. After skin penetration, invasion of the peripheral venous system occurs and the cercariae are carried through the circulation of the right side of the heart and pulmonary circuit, then the left side of the heart, aorta and superior mesenteric artery, with eventual entry into the visceral or portal circulation. The cercariae mature in the intrahepatic branches of the portal vein and then travel back against the blood flow to the mesenteric veins, especially the inferior mesenteric and hemorrhoidal plexus where copulation and egg-laying occur. The passive transport of eggs within the lumen of the veins to the liver results in local destructive changes with granulomatous cellular and fibrous reaction. These granulomatous areas may remain clinically silent[3] or progress to cirrhosis of a periportal type with resultant portal hypertension, esophageal varices, splenomegaly and ascites. Since the disease is contracted at an early age when children are permitted to wade or bathe in contaminated stagnant or slow flowing waters, the cirrhosis begins in the first and second decades of life and may reach an advanced stage before the patient is twenty years old. In addition to the transport of eggs to the liver, many eggs are trapped in the smaller venules of the wall of the bowel by endothelial proliferation and perivascular cellular reaction. The escape of eggs from the venules in the submucosa and mucosa of the bowel results in a cellular, fibrous, granulomatous response with pseudotubercle formation and proliferative polypoid reaction. The eggs which are not encapsulated and calcified work their way through the mucosa into the lumen of the bowel to be passed out in the feces to continue the cycle.

Patients may harbor the parasite and present no symptoms or only mild symptoms of chronic debility usually with vague abdominal complaints. The prominent signs of the disease, however, are cirrhosis of the liver with splenomegaly, portal hypertension, esophageal varices, ascites and anorectal colonic manifestations.

Since 1940, when I first became aware of this disease, I have been impressed with the sigmoidoscopic findings of the mucosa of the rectum and sigmoid. I have consistently noted the presence of punctate hemorrhages and erosions, discrete or in clusters, varying from pinpoint or pinhead size without any surrounding inflammatory reaction.[4] These hemorrhages and minute ulcers were interpreted as points of extrusion of the eggs through the

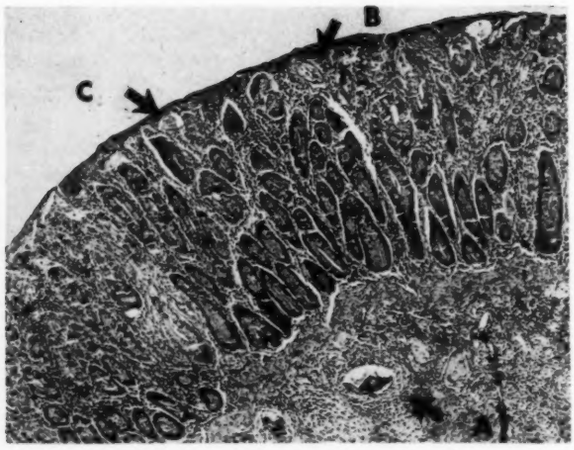


FIG. 1. Section of rectum of monkey experimentally infected with Schistosoma mansoni and Balantidium coli. A, egg lying within lumen of venule with perivascular reaction. B, egg in process of being extruded through mucosal lining; note clear tract in the stroma between the glands representing pathway of egg from submucosa to the surface. C, egg in venule just beneath mucosal surface. (Section of monkey by courtesy of Drs. D. A. Berberian and E. W. Dennis, Sterling-Winthrop Research Institute, Rensselaer, New York[5]).

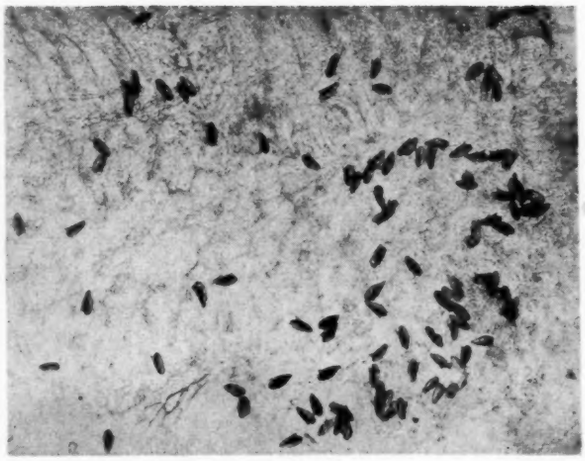


FIG. 2. Patient D. E., age thirty-one. Biopsy rectal mucous membrane transparency (unstained) positive for lateral spine Schistosoma mansoni eggs. Puerto Rican patient admitted with lobar pneumonia, enlarged liver and abnormal liver function tests (heavy alcoholic). There were two negative stool examinations for parasites and ova. Punctate erosions of mucous membrane of rectum and sigmoid on sigmoidoscopy. (From: Medical Service, Beth David Hospital, H. Solomon, Director; E. Appelbaum, Attending.)

mucosa into the lumen of the bowel. When there was no active bleeding from the ulcers, they had a brownish discoloration due to decomposed blood. The mucous membrane may appear normal in color but is usually pale, reflecting secondary anemia frequently due to multiple parasitism, especially hookworm. A diffuse hyperemia may occur and edematous, boggy mucosa with loss of configuration of the rectal valve has been observed, especially in the presence of ascites.

In addition to the erosions and petechial hemorrhages, one may note miliary raised granulomas or excrescences of fresh granulation tissue of varying size and in varying stages of polypoid formation from rough irregular outgrowths of tissue to organized polyps. In massive infection the mucosal erosions may be larger, resulting in superficial ulcerations with bleeding. When submucosal hemorrhages occur in profusion, the overlying mucosa presents a speckled, red macular appearance. The decomposition of hemoglobin produces light brownish pigmentation. Fibrous contracture in the submucosa results in loss of the elasticity of the mucous membrane with retraction, puckering and pitting as previously noted. Pitting of small ulcers with brownish discoloration may give a mottled appearance to the mucosa.

I recently had the opportunity to proctoscope a Macacus rhesus monkey* experimentally infected with Schistosoma mansoni. The mucous membrane of the rectum and terminal sigmoid presented findings similar to the human, namely, edema, hyperemia, raised fresh granulomas becoming polypoid, erosions and punctate hemorrhages. I also examined in the immediate postmortem state the colon and rectal mucous membrane of a mouse and a hamster (sixty-two days postinfection) infected with S. mansoni. Punctate hemorrhages and erosions were present. (Fig. 1.) The presence of eggs was confirmed by rectal swab in the monkey and by a biopsy specimen of the mucous membrane in the mouse and hamster. Photomicrographs of sections of the rectum of the monkey revealed submucosal granulomas and subepithelial mucosal eggs with actual extrusion of egg into the lumen.[5]

It is surprising that the mucosal changes have not been noted with the same degree of consistency by other observers. These changes are an integral part of the pathogenesis and life cycle of the parasite. In a very mild infection the presence of small pinpoint hemorrhages or ulcers may be overlooked.

The mucosal changes were noted to some

* Courtesy of Sterling-Winthrop Research Institute, Rensselaer, New York, March 21, 1956.

degree by Bercovitz and his associates,[6] Lyons and Benson,[7] Dombrosky,[8] Trubowitz and Redish,[9] and Ragheb,[10] among others. Many observers, however, reported no significant findings on sigmoidoscopy. The histopathology of polyps in this disease has been studied in great detail by Dimmette and his associates.[11]

Among the methods used for diagnosis of S. mansoni, identification of the eggs in the stool is most frequently employed. Ottolina and Atencia,[12] working in Venezuela, dissatisfied with the low percentage of positive stool examinations in clinically suspected cases, developed the technic of taking biopsy specimens of rectal mucous membrane and published their findings in 1943 under the title, "New Methods for Precise Clinical Diagnosis of S. Mansoni." Ottolina[13] referred to it in 1947 as "The Rectoscopic Biopsy by Transparency." The technical procedure is simple. Since very little tissue is needed, a superficial punch biopsy "bite" is taken from the edge of the middle rectal valve. The greatest concentration of eggs in this disease is in the rectum. I caution against taking a deep bite which may include muscularis. Bleeding from the site can be very embarrassing and may require electrocoagulation. An edematous mucosa with loss of rectal valve configuration may present slight difficulty for biopsy. The biopsy tissue is placed on a glass slide, teased apart, thinned and flattened out; a drop of saline solution is added, a cover slip or another slide is placed over the tissue for compression and it is examined under the low power of the microscope as a transparency without any stain. If eggs are present, they are easily identified singly or in clusters. The biopsy technic has been positive in about 65 per cent of clinically suspected cases in my series.[5] (Fig. 2.)

CONCLUSIONS

1. Attention is directed to S. mansoni as the cause for liver disease with portal hypertension, ascites, splenomegaly and esophageal varices in children and young and middle-aged adults of Puerto Rican geographic origin.

2. Sigmoidoscopy in S. mansoni infection reveals characteristic lesions of the mucous membrane of the rectum and sigmoid which represent stages in the life cycle of the parasite and in the pathogenesis of the disease. The lesions have important diagnostic significance and result from deposition of eggs in the submucosa with extrusion of the eggs into the lumen of the colon and rectum.

3. A biopsy specimen of the rectal mucous membrane, using the method of Ottolina and Atencia, offers a means for a rapid and precise diagnosis.

REFERENCES

1. Craig, C. F. and Faust, E. C. Clinical Parasitology, 2nd ed. Philadelphia, 1940. Lea & Febiger.
2. Most, H. Schistosomiasis in the veteran. *Veterans Admin. Tecbn. Bull.*, TB 10–33, pp. 1–13, 1947.
3. Deschamps, S. H., Redmond, J. L. and DeLeeuw, H. Hepatic granulomas in Schistosomiasis. *Gastroenterology*, 28: 990, 1955.
4. Warner, B. W. Ano-rectal and colonic manifestations of Schistosoma mansoni infection (intestinal bilharzia). *Am. J. Surg.*, 57: 168–172, 1942.
5. Warner, B. W. The role of the proctologist in the diagnosis of schistosomiasis mansoni by sigmoidoscopy and rectal biopsy. *New York State J. Med.* (In press.)
6. Bercovitz, Z. T., Rodriquez, R., Hargrave, D. W., Dickie, J. D. and Green, C. E. Studies on human Schistosoma mansoni infections: Proctologic picture in asymptomatic schistosomiasis mansoni infections. *J. A. M. A.*, 125: 961–963, 1944.
7. Lyons, R. T. and Benson, J. Schistosoma mansoni: a study of 26 Puerto Ricans in a non-endemic area. *Ann. Int. Med.*, 40: 1194–1206, 1954.
8. Dombrowsky, E. F. Schistosomiasis (Mansoni's) presentation of 25 cases. *New Orleans M. & Surg. J.*, 98: 362–365, 1946.
9. Trubowitz, S. and Redish, M. H. The rectal mucosal punch biopsy in the diagnosis of schistosomiasis mansoni. *Gastroenterology*, 14: 391–394, 1950.
10. Ragheb, M. Schistosomiasis of the liver. Clinical, pathologic and laboratory studies in Egyptian cases. *Gastroenterology*, 30: 631, 1956.
11. Dimmette, R. M. and Sproat, H. F. Recto sigmoid polyps in schistosomiasis. *Am. J. Trop. Med. & Hyg.*, 4: 1057, 1955.
12. Ottolina, C. and Atencia, H. New methods for precise clinical diagnosis of schistosomiasis mansoni. *Rev. Policlin., Caracas*, 12: 348–380, 1943.
13. Ottolina, C. The rectoscopic biopsy by transparency. A new diagnostic method for Schistosoma mansoni. *Am. J. Trop. Med.*, 27: 603–606, 1947.

DISCUSSION

Robert M. Dimmette (Bethesda, Md.): This is indeed a very important disease and one of international note, but it is somewhat infrequently seen in the United States. The disease, however, is considered to be of importance, and the diagnosis and much of the evaluation of treatment rests with the proctologist, who is a valuable member of a research team or of any team in the management of this type of disease.

As Dr. Warner has pointed out, the introduction of numerous uncomplicated cases due to foreign travel and immigration of infected individuals makes this condition extremely important. On the other hand, however, we are assured that no proved hosts of snails have been found in the United States that have sustained and infected human beings. Also, the sanitary and hygienic factors in the United States inhibit the spread of this disease, and therefore break the life cycle.

Three types of this disease may be encountered. The S. mansoni or schistosomiasis mansoni of South America, the Carribean and the Near East area is of utmost important to the proctologist, and Dr. Warner has described its pathology. This form is best known, but the entire nature of the disease has not been completely worked out.

S. haematobium, which is of great importance in Africa, is predominantly a urinary tract infection but is not limited to that site. In our recent studies we found that approximately 45 to 50 per cent of the patients harbored this same infection in the bowel, and could be treated by the proctologist.

S. japonicum, frequently seen in the Far East, the Philippines, Formosa and areas of recent interest, is visceral in type with a predilection to the lymph node system, and has discharge of the ova in the bowel for the completion of the life cycle.

The diagnosis is never made unless suspected and searched for. A patient's history is of extreme importance because exposure to and residence in an endemic area often leads to suspicion. Bathing in native waters or contact with known infected waters is usually the cause of infection. Bather's itch or allergic sensitivity of the skin is common.

A history of hematuria, bright red blood on formed stools, diarrhea, melena or even slight changes in bowel habits lead to suspicion. Fatigue, chronic anemia, malaise, mental dulling, personality changes and a continued urge to defecate or micturate are common complaints.

The proctologic examination is about the same for all forms of this disease and has been adequately discussed. The advanced stages, which are quite frequent in the African populations and in other areas of the world, may be of a multiple polyposis type. These may show extensive mucous production. They may be pedunculated or sessile polyps with hemorrhagic changes, and in some advanced stages of the disease we noted stenotic bowel walls with loss of motility, extensive ulcerations with ischemic necrosis, and calcific plaques associated with and without tumors. Some patients had frank prolapse which required surgical intervention; obstruction to the large bowel was also noted.

The treatment of this disease is both specific and general because patients in the advanced stages are usually quite debilitated. Supportive treatment with hematinics and such associated compounds is of great value in preparing these patients for an ultimate specific type of therapy. If surgical intervention is not needed, two types of local treatment are applied: specific treatment with antiparasitic drugs and antibacterial drugs. The antimony compounds are the best to date, and tartar emetic is fast-acting; these give demonstrable results and are tolerated by most patients, yet have certain serious anaphylactic complications with sudden death.

Fuadin,® named for King Fuad of Egypt, is easy to administer, slower in response and less frequently associated with serious reactions to treatment. The incidence of nausea, vomiting or immediate gastrointestinal effects is lessened, mainly due to the route of administration via muscle.

In far advanced cases or in patients with polyposis, it has been assumed that the visible polyps disappear after treatment. This has not been found to be true, and the pathologic studies are inconsistent with this type of assumption. Lesions of the lung and bladder, and severe lesions of the liver also do not completely regress.

The snip and press method of examination is the best procedure for establishing the viability of active infections, and is often an indication as to the type present. This method is anatomically sound because the escape of the ova is by migration from the venules into the mucosa, and by the connective tissue papillae. A deep biopsy is not indicated, and even a full thickness of the mucosa is not required.

The deeper type ova or eggs are usually swept through the portal system into the liver where they excite the picture of cirrhosis, which is both of the finely nodular type and the gross granular type. This is a severe complication.

Why is the disease of some importance to you? The World Health Organization and the United States Government do spend a great deal of money for detection of the disease in both snails and in humans, and for the control of the snails and the treatment of patients.

In Egypt and Northern Africa this disease is quite endemic and of a serious nature. Of 5,000 serial admissions (Americans as well as Egyptians) to an admissions hospital located in the middle of the delta of Egypt, we detected 213 cases of severe schistosomiasis of the bowel. Forty patients (18 per cent) had polypoid tumors that required surgery for relief of symptoms. Of 319 random surgical specimens of the bowel sent to my department in Cairo over a one-year period from various Middle East hospitals, 206 (75 per cent) showed schistosomiasis of the bowel and 20 per cent of these had polypoid lesions of the rectosigmoid colon.

Of 155 random autopsies of patients over five years of age, forty-one (26 per cent) had schistosoma infections, and 17 per cent of these had single

or multiple polypoid lesions of the rectosigmoid colon.

The infrequent, bizarre bowel changes in South American and Puerto Rican patients have caused some speculation as to why this varies from those patients in the Middle East. No true explanation has been accepted. In our group we believed that the socioeconomic conditions, the continued early-age infections and repeated reinfections were of significance and importance.

I would like to mention just a few points about some associated studies because of the interest in this disease.

No relationship was demonstrable between schistosomiasis and the cause of carcinoma of the colon in a study we made on ninety-eight patients with cancer. Only seventeen of these patients who were in an endemic area were harboring both types of disease.

Liver infections are quite common and complicate the disease; they can be demonstrated in more than 65 per cent of the infected patients by wedge biopsy, and in 25 per cent of the patients by needle biopsy; therefore, wedge biopsy is the procedure of choice.

The smear technic of urinary sediment has proved to be good for indicating pathogenic changes of malignancy even in young patients. In a recent study we found that carcinoma of the bladder was very common. It was a serious complication and was found even in young age groups, the youngest patient being six years of age.

The tissue reactions in the group classifications of these types of carcinoma of the bladder indicate that there is a metaplasia present, and more than 55 per cent of the patients have squamous cell carcinoma, as opposed to the usual type of carcinoma of the bladder.

In our pathologic studies of the patients having this schistosomal type of disease, it was believed that the retained dead forms in the tissue excite or produce continued tissue reactions long after the active infections are treated with clinical satisfaction, so that no adequate parasiticide has been developed for this type of disease to date; and even though the patients are removed from an infected, endemic zone, complications will occur up to twenty and thirty-five years later.

VICTOR C. TUCKER (San Antonio, Tex.): I would like to emphasize the fact that the examination should be made by a man who is able to perform proctologic surgery. In some centers the work is done mostly by members of the department of gastroenterotomy.

In one of our best and largest centers a considerable amount of this work has been done. In the beginning the department of medical proctology was located some distance away from the department of surgical proctology. Although they had the facilities to stop hemorrhage, they had one very severe hemorrhage. This patient was in shock in the ambulance before he reached the surgical team. The two departments now work in adjacent offices.

The examination is easily done. The ova are easily identified and are clearly seen in the microscope. The biopsy should be taken either by a surgical proctologist, or the two departments should work together closely.

JOSHUA A. MALGIERI (Syracuse, N. Y.): Due to the large influx of Puerto Ricans to this country, most of whom are in New York City and New York State, I wonder if a problem arises in our blood banks when blood is obtained from these persons. What would be the hazard to others receiving this blood if larvae are present in the circulatory system?

BENJAMIN W. WARNER (closing): After the initial invasion of the skin, the cercariae enter peripheral veins, pass through the pulmonary circulation, and then enter the aorta and superior mesenteric artery, thence into the portal venous system. Here they grow to adult worms. Thereafter there are no cercariae present in the general circulation, and I can see no contraindication to taking blood for transfusions from persons from Puerto Rico.

Regarding Comdr. Dimmette's discussion, I was impressed by the similarity between the lesions he observed in the bladder in S. haematobium and the lesions I have noted in the rectum in S. mansoni infection.

Experience with the Optical Density Cancer Detection Test

PAUL J. FUZY, JR., M.D., *Youngstown, Ohio*

RECENTLY Quinn, Katz and Rappoport at The Youngstown Hospital Association have reported on the development of a screening test for cancer based on the optical density of serum.

Three groups of persons were tested in this study: (1) normal, seemingly well persons; (2) pregnant women and patients having diseases other than cancer; (3) patients with cancer histologically proved by biopsy or autopsy. The results were interpreted as follows: (1) True positive: a patient with histologically proved cancer, whose measurements of optical density fell within the crosshatched zones on Figure 1. (2) True negative: a patient having no detectable clinical evidence of cancer whose measurements of optical density fell outside the crosshatched zones. (3) False positive: a person having no detectable clinical evidence of cancer, whose plotted measurements fell within the crosshatched zones. (4) False negative: a patient with histologically proved cancer whose measurements fell outside the crosshatched zones. It is to be noted that the positive zones here were established arbitrarily, on the basis of preliminary testing of known cancer patients.

In the original report a total of 1,736 patients were tested, with an overall accuracy of the test of 90 per cent. Since that time the series has been extended to over 5,000 persons with a slight increase in accuracy. Analysis of the persons tested in the original group showed 477 normal persons, 946 non-cancerous patients and 313 cancer patients. The sex distribution of the series was exactly equal.

Of the 477 normal patients tested, 97.7 per cent were true negative while 2.3 per cent were false positive. The 946 non-cancerous patients showed 86.3 per cent true negative results, with 13.7 per cent false positives. In this latter group it is interesting that both acute and chronic inflammatory disease and pregnancy gave the bulk of the false positive results. In cancer patients true positives varied from 93 per cent in the well differentiated cancers to 75 per cent in poorly differentiated types. Similarly the accuracy varied with the extent of the cancer, being 100 per cent in occult cancers and dropping to 69.4 per cent in terminal, generalized cancer.

We believed that further study of this test as applied to colon and rectal patients would prove interesting. For this reason, 100 cases admitted to the Proctology Service of The Youngstown Hospital Association, and in which optical density tests had been performed, were compiled. There were found to be thirty-two anorectal cases (including hemorrhoids, fissures and fistulas), forty-four cases of cancer, seventeen cases of polyps and seven miscellaneous cases which included four cases of diverticulitis, two with perforation. Results of the optical density test in these patients can be seen in Table 1. These results are similar to those of Quinn, Katz and Rappoport, showing an overall accuracy of 87 per cent. False negative results occurred in five cancer cases, all of which were classed histologically as poorly differentiated or moderately well differentiated. False positive results occurred in eight anorectal patients, only one of whom had a fistula. Follow-up studies on the anorectal patients would be of great interest. Unfortunately they have not been done because most of these patients were used as controls in the original series and no attempt at follow-up studies was then contemplated. At the time of the preparation of this report many had been lost to follow-up, and it was thought that repeat testing of the available persons would not be of much significance, since elapsed time in some instances was almost three years.

Retesting of the cancer patients was likewise

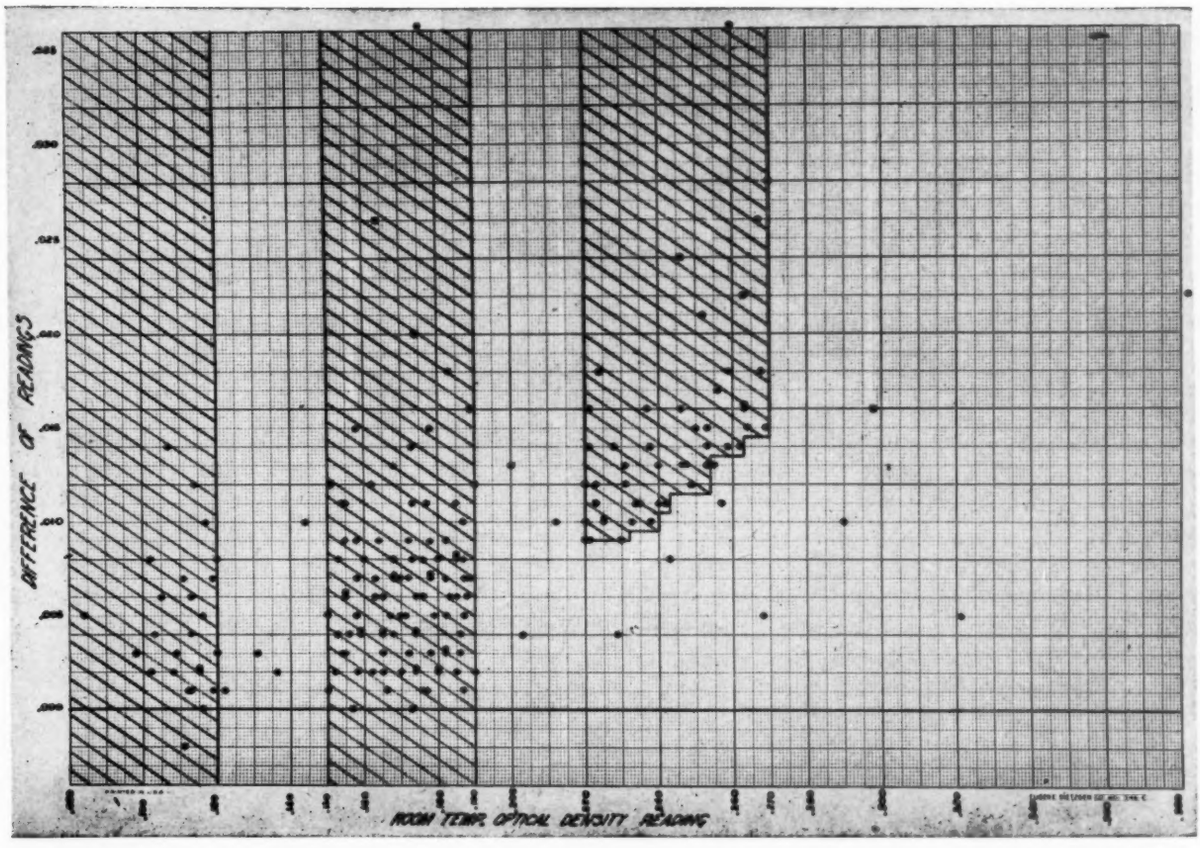


FIG. 1. Graph showing the concentration of measurements from 914 proved cancerous patients. The sharply delineated crosshatched zones represent the critical regions. At least 90 per cent of the patients with proved cancer fell within them. They would then be true positive. Those remaining outside the critical regions are false negative. (From: QUINN, KATZ and RAPPOPORT. Optical density of serum in cancer. *Am. J. Clin. Path.*, 25: 1128–1147, 1955.)

not done in any systematic fashion, since only a screening test was being sought. At present more work is being done in an attempt to determine whether or not any prognostic significance can be assigned to postoperative optical density tests. It has been discovered that in the first twenty-four hours postoperatively, results of the test are not reliable since they are affected to some extent by the state of hydration, administration of intravenous fluids, transfusions and the like. In all patients showing a true positive result preoperatively, in whom obvious cancer was not removed at operation, we have found a persistently positive result postoperatively on one or several examinations. Also serial testing of some of these patients has been done at regular intervals, and the optical density test has been seen to revert to negative in the terminal stages. This is, of course, in accordance with the finding of false negative results in the far advanced tumors as mentioned previously. No explanation for this phenomenon has yet been found.

An even more difficult situation is presented by attempts to assess the significance of negative or positive tests after resection of cancers in which excision of all grossly detectable cancer was possible. Until more is learned about the causes of false negative and false positive results, we cannot hope to have any answers on this score. The use of serial testing in conjunction with the so-called "second look" operations offers a fascinating field of speculation, but the collection of evidence of the true worth of such a procedure would be a difficult and longterm task.

Since inflammations had been found to give false positive results, it was expected that most of the false positive results would be in diverticular disease. It is interesting to note, however, that the small number of such cases all gave true negative results. This small series

TABLE I

RESULTS OF THE OPTICAL DENSITY TEST ON 100 PATIENTS

Results	Anorectal	Cancer	Benign Polyp	Malignant Polyp	Miscellaneous	Total	Per cent Accuracy
True negative	24	..	9	..	7	40	87
True positive	..	39	..	8	..	47	
False negative	..	5	..	0	..	5	13
False positive	8	..	0	..	0	8	

does not permit any conclusion, although one would like to see the development of some new diagnostic aid in this problem. Drs. Quinn and Katz are at present working on a method of increasing the specificity of the test by plotting curves of the serum density over the entire range of the spectrum, using a Beckman ratio recording spectrophotometer. They find that these curves can then be corrected for bilirubin, hemoglobin, and the like, and can then be classified by shape as benign or malignant. This procedure has eliminated some of the false positive and false negative results of the original optical density test and will be reported in the literature by these authors in the near future. In spite of this refinement, however, it is not probable that the test will be of much value in diverticulitis or in revealing the presence of an early cancer in patients with chronic ulcerative colitis.

In the series at hand, a level of accuracy high enough to have diagnostic significance can be seen only in the series of seventeen benign and malignant polyps, in which neither false negative nor false positive results were found. This correlates with Quinn, Katz and Rappoport's finding of highest accuracy in small tumors and in well differentiated tumors. Here we wish to point out that no diagnostic importance has been attached to this test; we have not considered its results when deciding on colotomy and polypectomy versus resection, for example. More work by The United States Public Health Service as well as by men at our hospital is at present under way, however, and it can only be hoped that the collection of a statistically significant series of benign and malignant colon polyps will bear out the above findings. I am sure such an aid would be welcomed by every proctologist when the x-ray reveals a large polyp inaccessible to the sigmoidoscope.

SUMMARY

Experience with a screening test for cancer on a proctology service is reported.

Overall accuracy of the test was 87 per cent, with promise of a diagnostic level of accuracy in the field of benign and malignant colon polyps.

Acknowledgment. The research laboratory studies were supported by a grant from the John A. Hartford Foundation, Inc., New York City.

REFERENCE

1. QUINN, J. A., KATZ, S. A. and RAPPOPORT, A. E. Optical density of serum in cancer. *Am. J. Clin. Path.*, 25: 1128–1147, 1955.

DISCUSSION

GERALD L. WILSON (Detroit, Mich.): One of the most urgent needs in cancer work at the present time, short of discovering the cause and cure of this disease, is a simple cancer detection test. A cancer test, such as the Wassermann test for syphilis, would obviate the tremendous cost and energy now being expended in detecting cancer in an early stage by the rather tedious task of performing periodic physical examinations. Quite obviously, such a test would lead to many more cases of cancer being diagnosed and treated in an early stage, and hence a better survivorship.

For a cancer detection test to be practical, certain requirements are essential: (1) The test must be fairly specific for cancer. Most cancer detection tests in the past have been discarded because they separated the old from the young or the sick from the well, and had no specificity for cancer *per se.* (2) The test must diagnose cancer at an early stage

while cure is still feasible. Obviously, we don't need a test to diagnose far advanced malignancy. (3) The test must have a true positive accuracy of at least 85 to 90 per cent, and must have a false positive percentage of not over 5 per cent. (4) The test must be inexpensive enough to be practical for widescale use, and it must be simple enough to be performed by relatively untrained personnel.

The use of the optical density of serum, as developed by Quinn, Katz and Rappoport and described today by Dr. Fuzy in diagnosing colon malignancy, possesses most if not all of the requirements just mentioned. Most impressive are the results in benign and malignant polyps and the possibility of this test becoming a practical measure in differentiating between the two. Certainly this test looks promising and deserves further evaluation on a larger number of patients.

WILLIAM SCHEFFLER (Merchantville, N. J.): In about 1935 a cancer detection test based on skin reaction to embryonic cells was devised by Dr. Gruskin, which appeared promising. At the time I was interested and we found one condition which would give false positive reaction. We checked quite extensively with women who had had a tubectomy but who were still in the childbearing age and still producing ovae. We tested most of those women and practically all of them gave false positives.

I would like to ask Dr. Fuzy whether the aforementioned facts might have any relation to his tests and help to eliminate some false positives or whether, being applicable to embryonic tissue only, they might have no bearing on his procedure.

PAUL J. FUZY, JR. (closing): I cannot answer with any degree of accuracy Dr. Scheffler's question about the effect of the embryonic tissue, although some of the tests with false positive results were given in pregnancy, which may have a bearing.

The reason for the degree of accuracy that the test has is still under question; no one has yet discovered the answer. Since I am not involved in working on the test, I am pretty well behind in the work that is being done with it now.

I would like to say that the next polyp seen after this report had been made up, gave a false negative result. It was found that refrigeration of the serum prior to reading returned this to positive. A method for using the difference between the room temperature and refrigerated readings has been worked out, and gives a somewhat higher percentage of accuracy. However, it is hoped that a less complicated method can be devised for diagnostic purposes. We still do not have a test that will allow a clear-cut decision on surgery; therefore no decisions of that nature have been based on it as yet. We are hoping that when the Public Health Service finishes work on the test it may be that accurate. At present, however, it is used only for screening.

The Management of the Bladder Following Abdominoperineal Proctosigmoidectomy and Other Extensive Abdominal Surgical Procedures

A FIFTEEN-YEAR SURVEY

LOWRAIN E. MCCREA, M.D. AND HARRY E. BACON, M.D., *Philadelphia, Pennsylvania*

VESICAL atonia occurs quite frequently following abdominoperineal proctosigmoidectomy and other surgical procedures on the bowel. The presence of this complication need not be considered serious or permanent. Normal vesical function may be completely restored provided the condition is recognized early and proper treatment is instituted and maintained. These statements are established and substantiated by a survey conducted from 1940 to 1955, inclusive. A diagnosis of carcinoma of the bowel was made in 1,564 patients. Of these, 1,294 underwent resection of the bowel. Preoperative urologic examinations were performed on 933 patients who were observed and/or received therapy when necessary postoperatively. Ninety-three patients with temporary vesical atonia were observed and treated during the time of this survey. Normal urinary function was obtained in all but two patients: one committed suicide and the other had urinary incontinence for six years following an extended Miles abdominoperineal excision.

The cause of temporary vesical atonia is still considered to be surgical interference with the innervation of the bladder. The ideas and theories of the cause of vesical atonia were advanced in 1946. However, it was not until 1952 that original anatomic research in cooperation with Dr. Donald Kimmel was presented. At that time it was shown that an accessory innervation to the bladder exists. It was further demonstrated that after the removal of the primary innervation, as is done in abdominoperineal proctosigmoidectomy, Miles' excision and other types of surgery on the bowel and pelvis, the accessory innervation takes over and normal urination is re-established. That the accessory innervation is capable, competent and able to sustain normal urination, is proved by the fact that following "proctosigmoidectomy" and Miles' excision patients urinate normally without residual urine. The accessory innervation was demonstrated to exist by serial section of human embryos and by actual dissection of the adult. The nerve fibers of the accessory innervation were shown to rise from the sacral nerve roots (as does the primary innervation), traverse the endopelvic fascia and enter the bladder at the insertion of the ureter. The distribution from that point is similar to that of primary innervation. Due to the normal behavior of the bladder following surgery it was concluded that both sympathetic and parasympathetic nerves are present, as in the primary innervation. However, it is impossible to demonstrate microscopically the different types of nerve fibers. Temporary vesical atonia is considered to be the result of trauma to the nerve fibers of the accessory innervation following excision of the primary innervation. If permitted a period of grace, normal functional ability is returned, as the ninety-one cases in the survey have shown. Vesical atonia has been shown to have occurred ninety-one times (fifty-four males, thirty-seven females). (Table 1.) Vesical atonia was

noted as a complication following proctosigmoidectomy sixty-two times (thirty-nine males and twenty-three females) and following Miles' excision twenty-six times (fourteen males, twelve females). Atonia was exhibited by two women following sigmoidectomy and

TABLE I

VESICAL ATONIA

Abdominoperineal proctosigmoidectomy (562 patients)	62
Males	39
Females	23
Miles' excision (193 patients)	26
Males	14
Females	12
Sigmoidectomy (89 patients)	2
Males	0
Females	2
Anterior resection	1
Male	1
Females	0

by one man following anterior resection. Therefore, vesical dysfunction following abdominal surgery cannot be considered the result of obstructive uropathy or prostatic hyperplasia in every instance.

Urinary retention following surgery, due to existing and demonstrable prostatic hyperplasia, cannot be and is not considered vesical atonia. Prostatic hyperplasia was observed twenty-six times in this series. Twenty-three prostatic operations were performed, consisting of twenty transurethral and three suprapubic procedures. (Table II.) During this survey eleven transurethral resections and three suprapubic procedures were performed following abdominoperineal proctosigmoidectomy, eight transurethral procedures following Miles' excision and one transurethral resection following sigmoidectomy. Three patients have known prostatic enlargement with proved widespread metastasis. They are maintained by indwelling catheters. One patient has been advised to have prostatic surgery, but still has the suggestion under consideration. The differential diagnosis between vesical atonia and prostatic hyperplasia is done by cystometry and panendoscopy. Cystometry in obstructive uropathy due to prostatic hyperplasia will usually reveal a normal reading in contrast to the hypotonic curve exhibited in vesical atonia. It is possible that both conditions may exist simultaneously. In such instances it is suggested that prostatic surgery be performed, maintaining catheter drainage until the atonia is corrected. Panendoscopy in the presence of prostatic hyperplasia will always reveal an intrusion of a lobe or lobes of the prostate on the posterior urethra. Basically, prostatic disease may exist when the patient is first seen. It is believed that a patient

TABLE II

PROSTATIC OPERATIONS PERFORMED TO RELIEVE URINARY OBSTRUCTION

Abdominoperineal proctosigmoidectomy	14
Transurethral prostatic resection	11
Suprapubic prostatectomy	3
Miles' excision	8
Transurethral resection	8
Prostatectomy (open surgery)	0
Sigmoidectomy	1
Transurethral resection	1
Prostatectomy (open surgery)	0

with proved, demonstrable malignant disease should benefit from surgery if the primary condition is treated before attention is surgically directed to the prostate.

Infection should always be looked for or guarded against in either vesical atonia or prostatic hyperplasia when catheter drainage is used. Surveillance should be constant and rigid. It has been a surprising revelation to observe the number of patients with demonstrable bowel lesions who exhibit evidence of infection when first examined. In a previous survey it was found that 68.9 per cent of persons with malignant disease of the bowel had a positive urine culture at the time of the original examination. In the present series, 933 patients were seen and examined (Table III) and 815 urine cultures were taken. A personal review of the hospital records revealed that in 313 patients (38.3 per cent) an infection of the urinary tract was present before surgery or developed during hospitalization. Of 565 instances in which proctosigmoidectomy was done (303 males, 262 females) there were 166 individuals who exhibited positive urine cultures (ninety-two males, seventy-four females). Of these, seventy-four patients exhibited infection (forty-one males, thirty-three females). Sigmoidectomy was performed eighty-nine times (forty-six males, forty-three females). Infection was observed in twenty-five instances (fifteen males, ten females). The bacterial flora revealed by these cultures were not remarkable or unusual. In the majority of instances the bacteria were confined to the gram-negative group. However, there were instances when

gram-positive cocci were found in pure culture. The most commonly observed organisms were Bacillus pyocyaneus, B. coli, pseudomonas, Aerobacter aerogenes and B. proteus, in that order. Normal urinary elimination and antibiotic therapy are important factors in the control of infection of the urinary tract and must be individually considered in every instance. It was frequently demonstrated that these organisms were very resistant to therapy. In many instances it was necessary to perform sensitivity tests before eradication of the infection was complete. Once an infection is apparent, the medication to which the organism is sensitive is continuously administered until repeated cultures show the infection is eradicated. It is believed that in treating urinary tract infections there is a tendency to stop medication too quickly and in many instances to administer minimal dosage rather than maximum dosage of the selected drug.

TABLE III

URINARY TRACT INFECTIONS FOLLOWING SURGERY*

Abdominoperineal proctosigmoidectomy	166
Males	92
Females	74
Miles' operation	74
Males	41
Females	33
Sigmoidectomy	25
Males	15
Females	10
Infection—other surgical procedures	48

* Of 815 urine cultures taken, 315 gave positive results. The following bacterial flora were reported: Pseudomonas pyocyanea, coliform, B. coli, A. aerogenes, Proteus vulgaris, paracolon, Staphylococcus albus and Streptococcus hemolyticus.

MANAGEMENT OF VESICAL ATONIA

Rest is considered the best method of preserving the musculature of the bladder and of preventing permanent vesical atonia. Rest may be accomplished by inserting an indwelling catheter or by instituting cystotomy drainage. However, it is believed that catheter drainage is preferred as it does not subject the patient to further surgery. Vesical atonia should be anticipated in every patient undergoing surgery. Steps should be taken to control the dysfunction before it occurs. A definite and specific routine, such as the following, should be maintained.

Preoperative. Urine cultures should be taken to ascertain the presence or absence of infection. Cystometric studies will determine the muscle tone of the bladder. The value of preoperative cystoscopy and panendoscopy cannot be underestimated. In this series, primary transitional carcinoma of the bladder has been observed six times. These tumors were small, were proved by biopsy and were destroyed by transurethral resection or electrocoagulation. All have been repeatedly rechecked cystoscopically without evidence of recurrence. Invasion of the bladder by an extrinsic malignant process has been observed nine times. Of these, two patients had partial resection (one male, one female), and seven had pelvic exenteration (four males, three females). Panendoscopy in the male will reveal the extent of the prostatic intrusion on the posterior urethra. All of this information is of inestimable value to the surgeon.

Postoperative. The bladder should be maintained at complete rest either by catheter or by cystotomy. Catheter drainage is preferred. The bladder may be maintained by continuous catheter drainage or by tidal drainage. A cystometric reading is done on the fifth postoperative day. If normal, the patient is permitted to void and the residual urine, if any, is measured. If the residual urine is 60 cc or less, the patient is permitted to continue to void normally. If the cystometric reading is not within the normal range, catheter drainage is continued. If the amount of residual urine is more than 60 cc., the catheter is reinserted and maintained until the tenth postoperative day when cystometry is repeated and the residual urine is measured.

In males, it may then be determined whether the residual urine has a neurogenic basis or results from enlargement of the prostate. If atonia exists at the time of the patient's discharge from the hospital, the catheter is permitted to remain *in situ* and the patient is checked at weekly intervals, at which time the catheter is changed. Catheter drainage is maintained in patients who do not have obstructive uropathy, until the patient is able to void with a residual of 2 ounces or less.

It is imperative during this phase that infection be controlled and eradicated if possible.

Of ninety-one patients with vesical atonia, all have returned to the normal function of urination with the exception of the two previously mentioned cases.

SUMMARY

A survey covering a fifteen-year period (1940 to 1955, inclusive) has been made.

A total of 933 patients were seen and examined preoperatively. Urine cultures were taken 815 times. Abdominoperineal proctosigmoidectomy was performed 565 times (303 males, 262 females) with the occurrence of vesical atonia in sixty-two patients (thirty-nine males, twenty-three females), or 10.9 per cent. Urinary tract infection was observed in 166 instances (20.19 per cent). Prostatic surgery was performed on fourteen patients (transurethral resection, eleven, suprapubic prostatectomy, three).

The Miles type of excision was performed 193 times (101 males, ninety-two females). Vesical atonia occurred in twenty-six patients (fourteen males, twelve females), or 13.4 per cent. Urinary infection was observed and treated seventy-four times (forty-one males, thirty-three females), or 39.9 per cent. Prostatic surgery was performed eight times; all were transurethral resections.

Sigmoidectomy was performed on eighty-nine occasions (forty-six males, forty-three females). Vesical atonia occurred in two patients, both females. Infection was seen and treated twenty-five times (fifteen males, ten females), or 28.4 per cent. Transurethral prostatic resection was performed once.

Primary transitional carcinoma of the bladder occurred six times. All patients were treated by transurethral procedures. Invasion of the bladder from extensive malignancy was observed nine times. Partial or segmental resection of the bladder was performed twice (one male, one female). Total cystectomy and pelvic exenteration was performed seven times (four males, three females).

CONCLUSIONS

The value of routine preoperative and postoperative urologic examination of patients undergoing major surgery on the bowel is clearly demonstrated.

Vesical atonia occurs in both males and females. Vesical atonia and urinary retention associated with prostatic enlargement differs widely in concept and management.

Maintaining the bladder at complete rest without infection is considered the best management of temporary vesical atonia. Time and proper management will permit and promote a return to a normally functioning bladder.

Panel Discussion

PRESIDENT STUART T. ROSS: I know of no one who has given more thought to the deliberations and discussions and to the various problems concerned with extramedical problems than our distinguished Past President, Dr. Louis A. Buie of Rochester, Minnesota, who needs no further introduction from me.

DR. LOUIS A. BUIE: We are all aware that the physician can no longer limit his activities to the care of sick persons. I imagine it is because of this philosophy that our Program Chairman, Dr. Jackman, conceived the idea of including this Panel on the program.

It is our very good fortune to have three distinguished gentlemen of the official family of the American Medical Association with us. These men are well versed in the topic they intend to discuss. Each of them will be given an opportunity to discuss a subject that he considers vital. Any questions which might arise will be presented to the speakers as long as time will allow.

I would like to present first Mr. R. G. Van Buskirk, who is a member of the Law Department of the American Medical Association and the Executive Secretary of the Committee on Legislation of the A. M. A. Mr. Van Buskirk will discuss the medical legislative picture.

MR. R. G. VAN BUSKIRK: The particular extramedical problem taking most of my time is legislation. With the growing complexity of the society in which we live, this legislative task—the number of bills introduced and the minute details of all of our lives that these bills affect—has been growing year after year and month after month.

We have found in the last few months a growing development of what I call the "great white father concept," that is, that every problem of mankind, whether it be here or abroad, must be solved in Washington. There are medical problems; you certainly know that. The woods are full of people who are willing to solve those problems in Washington. There is an unfortunate thing about it. One of my old law professors used to say, "There is no one who can discuss a subject so fluently as the person who is unimpeded by any knowledge of the facts."

We have that sort of situation with some of our legislators who sit down to solve these medical problems on the Potomac.

One of the members of Congress told me that forty years ago, when he first went to the House of Representatives, being a congressman was a very good job. They went to Washington for approximately six weeks every year, made a few speeches, passed an appropriation bill and had a good, rousing fight on the tariff and then went back home.

"But," he said, "something happened. The job isn't so good any more. Now we are there all the time. We are passing legislation on all kinds of subjects, subjects which in 1913 when I first went to Congress if anybody had mentioned as being anywhere near the proper interest of Congress, the man in the white coat would have come and would have taken him away."

As an example of the scope of this medical legislation, in the 83rd Congress, which was in session in 1953–1954, 15,000 bills were introduced in that two-year period. Of these, 407 had medical implications. In the 84th Congress, in the 1955 session alone, approximately 12,000 bills were introduced, 403 of which had medical implications.

In the current session of the 84th Congress we have had about another 5,000 bills, approxi-

mately 150 of which affect you in your practice of medicine. It gives us a total for this two-year period (which is not over yet) of 17,000 bills, 550 of which affect medicine.

These bills affect the doctor in his day-to-day practice; they affect the quality of medical care that he can provide his patients, and in the long run they affect the patients. Let me give you just a thumbnail sketch of some of the subjects that are covered: Narcotics, barbiturates, amphetamines. Last year we had the Salk polio vaccine and the federal role, if any, with respect to that vaccine. We had the Doctor Draft Act. Now we have federal aid to medical education. We have the Alaska mental health bill. We have a bill to permit the appointment of osteopaths as military medical officers. We have various amendments to the Social Security Act. We have a health reinsurance proposal. We have a mortgage loan proposal with respect to hospital and other medical facility construction.

We have a number of research bills. We have legislation dealing with the Veterans Administration medical benefits. We have legislation dealing with career incentives for military medical officers. We have legislation that would affect licensure by the states. We have legislation dealing with the admission to practice of foreign physicians. We have legislation affecting hospitals, nurses, nursing homes, air pollution, water pollution and so on. These are just a few of the subjects.

In order to try to bring some kind of order out of this maze of bills, the American Medical Association devotes some of its time and effort to legislative activities on the national level. This Association has developed a reputation in many quarters as being quite a lobby in Washington. Actually, well under 2 per cent of the A. M. A.'s budget goes to legislative activities of all types.

What we attempt to do (and I speak as one of your employees who attempts to carry out your policies established through the House of Delegates and the Board of Trustees) is to lay down a broad policy in the House of Delegates by delegates representing your views in these different areas.

As individual measures are introduced, we try to scan them in the Washington office and in Chicago to find out how they relate to this policy, and what they will do to medicine, to you and to your patients, and then we decide whether these measures should be supported, opposed or modified.

We try to do this through the medium of the Committee on Legislation. This Committee is not a staff committee; it consists of ten practicing physicians from all quarters of the country. The Committee meets frequently to discuss these measures and to adopt a policy position for recommendation to the Board of Trustees. I have the privilege of serving as Secretary to that Committee.

A policy having been adopted, our next task then is to attempt to translate that policy into action—to attempt to procure the enactment of a bill which is good, to kill a bad bill or to bring about desirable modifications in bills.

We can prepare the very best kind of testimony; we can bring the foremost physicians in the country to Washington; we can make a most logical presentation of the views of medicine for or against a measure. Yet very frequently that kind of presentation falls on deaf ears or is not heard at all because the congressman wants to know what the people in his district think about the measure and he wants to know whether it is apt to help or hinder his chances to come back after the next election.

The A. M. A. has no vote, but its member physicians do, and necessarily we have to ask for your assistance in educating the individual congressman to these legislative problems concerning which he knows virtually nothing.

The fund of misinformation on medical subjects possessed by congressmen is truly amazing. They are completely innocent of the things which are most obvious to you as physicians.

In hearings on the osteopathic measure we found, for instance, that congressmen did not have the vaguest idea what the difference was, if any, between a doctor of medicine and an osteopath. They made several comments, for instance, that medicine up until a few years ago had blackballed physical medicine and rehabilitation but that now we recognize it as a proper specialty.

One congressman, after full hearings, expressed the opinion that it was a great waste of time to require a man to go to medical school for four years before he could become a psychiatrist. Why did he not just start out by doing his postgraduate work and being a psychiatrist without wasting all that time

becoming an M.D.? We run into this type of thing all the time.

This problem is something we cannot solve; it must be solved by you in your own communities. All of you as leaders in your communities are well acquainted with men in other walks of life who help form public opinion in your cities, counties and states. To the extent that you in your day-to-day life can help correct these misinterpretations and misapprehensions, you are going to do a tremendous job—a job that has to be done in laying a sound foundation for a sound approach to these medical problems with which our congressmen are trying to deal.

I have had to paint the picture of medical legislation with a very broad brush. I will be very happy to discuss individual bills if anyone has any questions about them.

So far, through a combination of great good fortune and fine cooperation from individual physicians and from medical organizations, we have done fairly well in the 84th Congress.

The social security bill, HR 7225, is the big measure this year—the big measure for you this year and for most of the years to come.

Unless something totally unexpected happens, the remainder of our legislative program will show a fairly good two years. However, that is only two years, and the congressmen returning in 1957 will have to deal with the same problems all over again.

This, then, is the picture. It is a continuing fight to try to prevent the people in Washington, who for the most part have good intentions but very little knowledge of the problems, from ruining the thing to which you are devoting your lives—the proper care and treatment of your patients.

DR. BUIE: Thank you, Mr. Van Buskirk. We are very fortunate to have this Committee on Medical Legislation. The members work very hard and accomplish a great deal. As Mr. Van Buskirk has said, there is still a great deal to be accomplished. You will recall that he has asked for your assistance.

In the *Journal of the American Medical Association* there is an Organization Section with which you are familiar. In that Section you will find the opinions and attitudes of the A. M. A. in regard to the various bills that come before Congress. Frequently, by carrying the opinions that are expressed in the Committee hearings, and which are recorded in the Organization Section, to the men you know at home who are in Congress, you can give an inestimable amount of help to this Committee.

Now it is my pleasure to introduce Mr. George Hall. Some years ago he was our Parliamentarian in this organization. At present Mr. Hall is a member of the Law Department of the A. M. A. He is also Executive Secretary of the Council on Constitution and Bylaws. Mr. Hall will discuss the subject, medicolegal problems.

MR. GEORGE HALL: I am glad to be back to speak with you again. There are a few extramedical problems which I would like to mention. These are medicolegal problems as distinguished from legislative problems.

Briefly, medicolegal problems, medical jurisprudence and legal medicine are all more or less synonymous terms, and the subject matter covered by these terms has been rather slow in developing. It was mentioned first in the Justinian Code many years ago. It was mentioned in 1532 in the code of Emperor Charles V of Germany when he decreed that the opinions of medical men should be admitted in court in cases of violent death or unusual accidents. It was mentioned again by Henry IV of England in 1606 when he appointed medical examiners for a number of towns and cities, and said that the testimony of those medical examiners should be admitted in court in cases of violent death or cases involving wounded persons.

What do these terms really mean? Well, they are sort of a two-sided coin. On the one hand, the terms, which are all more or less synonymous, mean the application of law to medical or scientific problems; on the other hand, they mean the application of science or medicine to legal problems.

As an example, the application of science to legal problems: What are some of the problems that arise here? Well, the one that people think of most often is the medicolegal autopsy. This has to do with criminal law, of course, and involves all the activities of the medicolegal pathologist in examining a dead body. He can determine, in many instances, the sex of the body by small parts of it; he makes estimations of the time of death or the cause of death and all manner of information about the dead body that is of invaluable assistance to the prosecuting attorney. I am sure no prosecuting attorney would ever go to court in a murder

case without having the testimony of a good medicolegal pathologist behind him.

Some other instances are: the use of blood stains merely to determine the identity of a person and to determine whether or not that person was present at the scene of a crime; the use of blood-grouping tests in paternity cases; the use of blood, breath and urine to determine the degree of intoxication of a person charged with operating a motor vehicle while under the influence of intoxicating liquor.

You are all familiar with some of the other problems that fall within this classification such as fingerprinting, ballistics, the use of the lie detector, the use of truth serum and so on. You have read about these in the newspapers but you may not have realized that they are medicolegal problems.

There are many medicolegal problems which require the application of science to law. The administration of the food and drug laws, for example would collapse if there were not proper medical testimony as to whether or not a drug has been properly labeled, or mislabeled, or whether it will do the thing which the advertiser so hopefully claims it will do.

Mr. Van Buskirk mentioned the administration of the narcotic laws as a medicolegal problem. It is, in its broad aspect. Such laws cannot function without scientific and medical support behind them. The workmen's compensation laws and occupational disease laws are in a similar category.

What is on the other side of the coin (the application of law to science)? Some topics fit both classifications, of course. Medical legislation, in a sense, is the application of law to science, so it falls within both classifications.

Then there is the problem of sterilization. A number of states have enacted laws permitting the sterilization of certain mentally deficient persons. What about the application of law in an instance of suggested sterilization, where the patient comes in and says to the doctor, "I would like to be sterilized. We have all the children we can support, and my husband isn't making enough money. We want to limit the size of our family." Is the doctor authorized to go ahead and perform a sterilization under those circumstances? A eugenic sterilization? That is a medicolegal problem.

Artificial insemination is a medicolegal problem that has sky-rocketed into importance in the last few years, chiefly because of a case that arose in Chicago. Perhaps I will have a chance to discuss that a little later.

Partnership contracts, medical patents, privileged communications, expert testimony, human experimentation and medical practice acts are further examples of medicolegal problems.

Autopsies, and the ownership of parts that are to be removed during an operation, are another example. It may seem silly, but occasionally someone will want to know who owns the leg that was amputated or who owns the appendix that was removed.

Hypnotism is a medicolegal problem both in the application of science to law and in the application of law to science because of injuries that might occur while a person is under hypnosis, and injuries which a hypnotized person might render to an innocent third person. One of the medicolegal problems that you all have heard much about is malpractice, but that is a subject for an hour's discussion alone.

I am merely mentioning various problems in the hope that they will raise in your minds some questions which might properly be answered here.

All in all, just the recitation of these problems, I am sure, will indicate the great need that exists for a proper cordial relationship between the profession of medicine and the profession of law. Both of these groups are very much involved in all of these problems and they should be able to work together.

Fortunately, especially during the last few years, steps have been taken to improve the lawyer-doctor relationship. There have been meetings of lawyers alone where the lawyers have considered medical problems and have tried to brief themselves on some of the problems that the physician faces, so that by understanding those problems they will better understand the problem of what to do for the client-patient. There have been doctors' meetings in which an hour or two has been spent on various phases of these medicolegal problems, so that the doctor, especially the doctor who is sometimes called upon to testify in court, will know what problems are being faced by the attorney in the case and how, under our medicolegal system, he has to go about proving the best case for his client.

By understanding the reason for direct and cross examination and the reason for certain

administrative and technical steps taken in the course of the trial, as well as knowing how the lawyer has to function, the physician can be a better witness and can help his patient that much more when he is brought into court as a party to a lawsuit. There have been many joint meetings during the past year, sponsored by the A. M. A. Law Department and by state medical and bar associations, where lawyers and physicians have gotten together to discuss their mutual problems.

One of the most recent methods of endeavoring to improve this interprofessional relationship has been the adoption in some three or four states of what is known as an interprofessional code. Through this code the two professions set down, in a manner not unlike the physician's Code of Ethics, the ideals that they would like to see exist between the two professions so that in the future there will be a better understanding.

We members of the panel hope there will be some questions for us to answer later. I am sure we all appreciate the opportunity of being here.

DR. BUIE: We have been shown the importance of the Law Department of the A. M. A. I wonder if you realize that if you do have problems of a medicolegal nature and are at a loss about what to do, instead of consulting a local attorney you may communicate with the A. M. A. Law Department and gain a pretty clear conception of how your problem may be handled. This is one of the functions of that Law Department.

Certainly there is no more important phase of the activities of the physician than that which relates to press and public relations. You can recall a time when a physician actually felt that he should run away from a reporter who would ask questions with the purpose of publishing the answers in his newspaper; and because of fear of criticism by his colleagues, as I said, he actually would prefer to avoid the reporter.

Owing to the activities of the Department of Public Relations, of which Mr. John L. Bach is the Director of Press Relations, these problems are not so difficult any more.

It is very interesting to see Mr. Bach at work. At all the meetings of the A. M. A. he arranges for rooms to be set aside for the convenience of forty to fifty science writers and newspaper men from all over the country who barge in on him and sometimes make his life pretty miserable. Some of their requests are unreasonable. Mr. Bach has a language all his own and knows how to handle the men. We are very fortunate to have him here today. It gives me a great deal of pleasure to introduce Mr. John Bach.

MR. JOHN L. BACH: First of all, Dr. Buie, I want to thank you for a very gracious and complimentary introduction. I want to discuss three public relations problems at this time: (1) the doctors' feelings toward all of this medical publicity that you have been seeing in newspapers and magazines; (2) the relationship that exists between doctors and science writers; (3) what we can do about this controversial problem in the future.

We at A. M. A. headquarters receive countless letters from physicians who criticize and point to the evils of premature publicity. They want to see some sound method of evaluating drugs and discoveries so that people will not get the wrong impression. These physicians are deluged with requests from patients who read something in a magazine, and then take it to their doctor saying, "Try this on me."

Actually, as far as I have been able to learn, there is no single practical way of solving this problem. The reason is that the medical profession itself, as an organization, would find it very difficult to try to police any type of plan it might adopt to get away from so-called premature publicity. Any plan, if it were adopted, would be considered largely censorship on the part of the medical profession and certainly we do not want that.

Also, how are you going to control the day-to-day working relationships between doctors and more than 200 medical science writers who hold full-time jobs across the country? Who is going to take the initiative on any such plan? Is it going to be the medical profession, the medical schools, the pharmaceutical industry or the research laboratories?

It is naive to believe, too, that all firms can guard their secrets of unproved theories. You just cannot guard such secrets. Pharmaceutical firms realize this. It is naive to believe that you can do away with the optimism and enthusiasm for any piece of medical research. It is naive to believe that professional men—physicians, physicists, chemists—can keep their miracles under wraps for any length of time. It just cannot be done.

We are all acquainted with some of the bad publicity on new drugs. There is a resolution which will be introduced at the Chicago meeting of the A. M. A. that touches on this very subject. I am sure the Reference Committee, to which that resolution will go, will give it serious thought and study.

A lot of this publicity on new drugs put out by certain firms (not all of them) cannot live up to all the ballyhoo given them, but nevertheless it is not easy to distinguish between worthless and effective drugs. The physician is forever asking, and rightly so, that a drug be clinically proved before it is announced or given publicity to any large extent.

Doctors see countless stories that cannot stand up—stories about drugs that perhaps "fall flat" after a year or two. They are aware, too, of the countless drug frauds that are perpetrated on the American people. You cannot help but realize why a physician, therefore, should be concerned. Doctors also see the worthless, unproved and lethal drugs that are sold across the counter after being given publicity based on nothing but the visionary claims of their discoverers.

There have been sensational stories. I can remember one of the tuberculosis drugs which was given a big play in a picture magazine, showing the patients dancing in the halls. Actually, that story was inexcusable cruelty to millions of persons who were tuberculosis patients at the time.

You remember the antihistamine hysteria and the coolness that followed stories about the cure for the common cold.

You know, the public has confidence in the printed word. If they see a story in a newspaper, they believe it must be true because it has been printed. However, that belief is beginning to change, and the medical science writer is cognizant of that fact.

The medical science writers today are very sincere. They always try to do a good job and they try to be accurate. We have to realize that medical science writing is here to stay, whether we like it or not. One of the reasons for this is that the public has an insatiable appetite for medical science news. There are probably two main urges in the human mind that account for that, i.e., the urge to know and the urge to live.

A short time ago I saw a letter which was received by a doctor. It said, "Doctor, I am suffering from a certain disease. I don't want to bother you with the details, but I would like you to send me the following information." He ended his letter by saying, "You know, Doctor, I am interested in living."

That is one of the big urges that account for the tremendous amount of medical news appearing in the lay press and in magazines.

Dr. Theodore Van Dellen, who conducts the health column for the *Chicago Tribune*, told me that during the month of February he received over 14,000 letters from readers which his office answered. His mail during the first three months of this year accounted for over 54,000 letters. That probably holds true for the Detroit papers and other papers in larger cities.

The doctor in his own mind sometimes believes that certain stories are premature. I do not know how long the science writer should wait, because actually a drug is never finally finished. There is always research work to do and work still continuing.

You probably have seen the recent stories on the oral antidiabetic drug being made by two pharmaceutical firms. Actually, if a doctor were to read those stories he certainly would classify them as premature, no question about it.

We made a study of the first articles about this drug which appeared in three of the biggest newspapers. I want to quote just a sentence from each paper, in which that paper expressed extreme caution to the lay public about this drug. This shows the effectiveness of the medical science writer in working with the medical profession.

Speaking of this drug on January 4th, the *Chicago Tribune* said: "Northwestern investigators warned the public not to build high hopes."

Said the *Chicago Daily News* on February 13th: "It may turn out to be a failure." On February 16th the paper said: "He emphasized it is still too early to say the pills are absolutely safe."

Said the *New York Times* on February 26th: "The new pills aren't yet available for general use, nor will they be until clinicians are certain that they have no harmful side effects and that they are satisfactory substitutes for insulin."

Said the *Chicago Tribune* on March 11th: "Physicians of the American Diabetic Association joined in a warning against undue opti-

mism that the compound eventually will replace insulin by hypodermic injection."

After you note the references carried by these newspapers, you can see that the science writers expressed a more than usual degree of caution to the public. When writers put that kind of qualification on a story, they are trying to do a sincere job.

The biggest problem and the biggest gripe that the medical science writer has today is the use of physicians' names in newspaper stories and magazine articles. Actually, there is nothing at all in the Principles of Medical Ethics—in the section which deals with publicity—relating to the use of a physician's name in print.

Recently, Steve Spencer, the science editor of *The Saturday Evening Post*, called me and said that a staff writer had worked up a story involving a hospital in an eastern state. The story had to do with a truck driver who had been seriously injured and the doctors at the hospital had given him up. The staff at the hospital decided that they would do everything they could to try to save the man's life. There were fifty-two people in that hospital who worked as a team and who did save the man's life.

The story was written for *The Saturday Evening Post*. When the editor of the *Post* read the story, he thought it was so interesting that he sent a photographer to the hospital to take pictures of the staff. Luckily, the photographer got all of the fifty-two people standing on the front steps of the hospital. The magazine was going to use a blown-up picture to illustrate the article, saying that those fifty-two people as a team, including six physicians, had saved the patient's life.

Then the question arose as to whether the *Post* could use the names of the six physicians. The local medical society said no. As a matter of fact, they held a meeting about it. So, Steve Spencer asked me if I would intercede. I said, "No, we can't do that. After all, the A. M. A.'s power comes from the bottom and goes to the top, not from the top down. If a local society says no, there is nothing we can do about it."

However, I did call the secretary and explained the situation to him. He said that the local society had agreed not to use the physicians' names. There was nothing I could do, but I did ask the secretary one question. I said, "Doctor, do you feel that this article was good for medicine and good for the profession"? He said, "There is no question about it. It is a terrific article for the lay public. It is bound to help medicine and help the profession."

I said, "It might interest you to know that if the *Post* can't use the names of these physicians in the caption under the picture, they are going to junk the story."

At heart I felt that medicine had lost; yet in Charlotte, West Virginia, the next Sunday, a full-page illustrated article appeared in the Sunday edition of the Charlotte *Observer* about a woman physician in that city, and it mentioned her by name. It not only gave her name but it also mentioned the names of eight other woman physicians in Charlotte. The whole story was built around this one woman physician. That local medical society believed that it was perfectly proper to use the physicians' names.

This situation is what puzzles the medical science writer. You probably can understand why. If the use of physicians' names is permitted in Charlotte, why is it not allowed some place in the East? Why not in New York or Colorado? Why does one medical society say no and the other one say yes? That is one of the puzzling things from the standpoint of the science writers.

I am sure that if men of good will and good reasoning within the profession will sit down and become better acquainted with the medical science writers in their own area, they will do a lot to remove some of the road blocks in medical communications. If you will do this, I am sure it will be for the benefit of medicine and for the benefit of the profession. After all, that is our goal.

DR. BUIE: I have taken the liberty of selecting one question for each of our guest speakers. There are enough questions here to take up the rest of the afternoon.

Mr. Van Buskirk, "How can individual physicians help in legislative activities"?

MR. VAN BUSKIRK: Obviously, first, out of your busy life you are going to have to give a little thought to some of the legislative problems facing medicine—to inform yourselves and come to your own conclusions as to what the solution should be. For instance, two fundamental questions arose concerning the Salk vaccine.

One was, "Should the federal government take the responsibility of providing a free

inoculation to every person up to the age of twenty-one and to all pregnant women"? Probably most doctors would come to the same conclusion about that, just thinking independently and without trying to find out what any other doctor was thinking.

Second, "Should the Secretary of Health, Education and Welfare in Washington be authorized to issue regulations governing the use of 'any medicinal substance' "?

Bills were actually introduced to do these two things. With respect to the second question, that obviously means you have to practice medicine with one hand on the Secretary's regulations; and if you guess wrong, there would be heavy criminal penalties. So, you should become aware that this sort of thing is taking place.

Next, when you have an opinion on something, express that opinion in your communities to your acquaintances and communicate that opinion to your representatives in Congress or to your state legislators if it is a state problem.

As I mentioned earlier, the persons who represent us in our legislatures for the most part are well intentioned, but they simply do not have the basic information that you have. They do not understand that what they are trying to do for the benefit of the public will backfire very frequently.

If you can just explain things to the leaders in your individual communities, they will come to very sound conclusions.

DR. BUIE: Just to give you some idea of how exciting this problem might be if we had time, here are a few of the questions sent in: "What has happened to HR 7225"? "Why is the AMA supporting the Bricker amendment"? "What has happened to the Jenkins-Keogh bill"? "Is the Doctor Draft Act likely to be extended"? All these questions are of exceeding interest.

Mr. Hall, "Must a physician respond to a subpoena? Can you make any suggestion that will be helpful to a physician who must appear as a witness"?

MR. HALL: Yes, a physician must respond to a subpoena, just as any ordinary citizen of our country must respond when he is subpoenaed to appear as a witness in a lawsuit.

The thing that seems to get the doctors so greatly perturbed is that they do not go into court very often. They do not understand the rigamarole and hodgepodge of a court proceeding and they get excited about it; hence they are unable to function at their best in the strange atmosphere of a courtroom.

In connection with this question, I had an opportunity to speak on the subject, "The Medical Expert Witness," not too long ago, and I jotted down nine things that might help a physician if he is called into court.

First, you must respond to a subpoena.

Second, you should keep full and legible records of everything you do in connection with the patients in your office, so that these records will be available if needed in court, and certainly so that they will be available to refresh your own recollection about the case which might have happened one, two or three years previously.

Third, review your case records before you are called upon to testify. Do not go into court without having looked back in your records to see what you did for the patient, because you will find that your memory is quite elusive and you will not remember all of the things you should.

Next, cooperate with your patient's attorney so that he will know what you know about the case, and therefore will be able to ask questions that will bring out the facts about the patient. You will not be groping around for facts, nor will he. After all, his client was your patient and both of you are interested in helping that person receive the justice he deserves.

Fifth, speak clearly and distinctly, and in non-technical language. Frequently doctors are so accustomed to using medical terminology that they will continue to use it before a court and jury. The jury is not familiar with the terms you use in hospital corridors, and the more they misunderstand, the less they trust and respect you. Use language, therefore, that will carry forth to the jury a concept that they can grasp and understand.

Sixth, do not exaggerate, and do not be afraid to say "I don't know" if you do not know something.

Next, do not become an advocate. You are there as a witness; you are not there to try to see that the patient wins his case. Tell the facts of the case as they are and do not color them in the hope that your patient will recover damages and therefore get a larger verdict.

Be courteous and do not try to outsmart the attorney who is examining you. He is usually

a pretty cagey chap who knows his way around the court while you do not, so just answer his questions in an honest and straightforward way and you will get along a great deal better.

Finally, do not volunteer information; just answer the questions that are asked of you and let it go at that.

DR. BUIE: I will ask Mr. Bach to answer this question: "How can a doctor handle his relations with the press in a way that will be satisfactory to the latter, without exposing himself to the charge of self-advertising"?

MR. BACH: The problem that I think confuses most doctors as far as the principles of medical ethics are concerned is the question, "Can I give information to a medical science writer or a reporter"?

The question that you have to answer in your own mind is, first, whether you went out of your way to give the information to the press or whether you were contacted by them.

The thing you have to bear in mind at all times is this: If you question the feasibility of giving information, contact the public relations chairman of your local medical society. In order to conform to the principles of medical ethics, a third party must be involved. That can be either a public relations man of your state or county society, or the public relations chairman.

As long as it does not appear that the doctor is seeking the publicity himself, if he contacts a third party and works through him, he will have satisfied the principles of medical ethics.

DR. BUIE: I would like to express my personal thanks to Mr. Van Buskirk, Mr. Hall and Mr. Bach for taking time from their busy schedules to meet with us at this time.

The Role of Enterotoxin of Micrococcus Pyogenes var. Aureus in the Etiology of Pseudomembranous Enterocolitis*

G. M. DACK, M.D., *Chicago, Illinois*

From the Department of Microbiology and The Food Research Institute, The University of Chicago, Chicago, Illinois.

As a student of the problem of food poisoning, I was early impressed by the similarity of cases of pseudomembranous enterocolitis following antibiotic treatment to those of severe micrococcic food poisoning. Micrococcus pyogenes var. aureus is a common denominator of both. Since not all strains of this organism produce enterotoxin which causes gastroenteritis, it was necessary to study strains from patients with micrococcic enteritis to determine whether they produced enterotoxin. In a study[1] of thirty coagulase-positive strains it was found that all thirty produced potent enterotoxin. Thus micrococcic enterotoxin appears to be the causative agent in pseudomembranous enterocolitis as well as in micrococcic food poisoning. I shall attempt to clarify the nature of enterotoxin and the conditions under which it is produced in relation to the etiology of pseudomembranous enterocolitis.

Wood, Bennett and Yardley[2] have described a fatal diarrheal disease in a commercial colony of chinchillas where the affected animals were fed for many months on pellets containing chlortetracycline. The disease terminated abruptly in the colony when chlortetracycline was eliminated from the diet. Since this disease in chinchillas is so strikingly similar to micrococcic enterocolitis in man, the following postmortem findings are quoted:

"During a period of two weeks, five animals in the colony developed typical manifestations of lethargy and diarrhea, refused to eat or drink, died within 12 to 36 hours. Autopsies were performed on four of these animals and revealed strikingly similar findings.

"With the exception of the presence of liquid fecal material in the gut, no gross abnormalities were present. Microscopic examination of histologic sections from the large intestine showed multiple areas of focal necrosis in the mucosa and shallow ulcerations covered by a pseudomembrane composed of fibrin, mucosal and inflammatory cells, many of which were degenerating, and mucus. Similar, but less extensive, lesions were seen in occasional sections of small intestine. There were accumulations of polymorphonuclear leukocytes and many mononuclear cells in the submucosa but none of the ulcerations extended beyond the lamina propria. The muscularis and serosa were intact. The lesions corresponded closely to those observed in human cases of staphylococcal pseudomembranous enterocolitis. Bacterial staining of representative sections revealed myriads of gram-positive cocci in huge clumps. In many areas, no gram-negative bac-

* Pseudomembranous enterocolitis represents the more severe cases of micrococcic enteritis.

teria could be found. No parasites or fungi were seen. There were no lesions of significance in the microscopic sections of lung, kidney, spleen, stomach, liver, adrenal and pancreas."

In two of these chinchillas no micrococci were found on blood culture. I have been advised that the strains of micrococci from these cases are to be tested for their ability to produce enterotoxin.

Strains of micrococci which produce enterotoxin are not easily recognized. There is no simple laboratory procedure which will distinguish those that produce enterotoxin. By growing the strains under suitable conditions and testing the resulting cultures or filtrates on susceptible animals such as monkeys or cats, the enterotoxin may be demonstrated. Unfortunately, no test animals have been found which are as susceptible as man.

Strains of M. pyogenes var. aureus which are associated with outbreaks of food poisoning and hence produce enterotoxin have been tested for their susceptibility to specific bacteriophages. Wallmark,[3] who has extensive experience with bacteriophage typing, stated: "There is one condition, however, in which a particular phage-group shows a significant predominance; food poisoning caused by enterotoxin producing strains of staphylococci. A large number of outbreaks have been studied, and the responsible strains have practically always been referred to phage-group III (6/47) (3, 4, 94)."

Williams[4] found that M. pyogenes associated with food poisoning belonged to group III bacteriophage types. Jackson, Dowling and Lepper[5] determined the bacteriophage types of M. pyogenes isolated from stools of patients with micrococcic enteritis as a complication of antibiotic treatment. They made the following statement regarding their results: "Approximately one-third of the typed strains were isolated by each of three different groups of workers, in three medical centers, the Boston City Hospital, the Mayo Clinic and our own hospitals. Strains of Group III and mixed Phage Group III-M were most common. Ninety-three per cent belonged to Group III, III-M or M. In contrast, strains of Group III-M were not recovered from a household contact in a single instance. The strains from each hospital formed eight or nine specific phage patterns and only two or three were common to any two of the hospitals studied. The patterns observed were very similar to those known to be associated with well-authenticated outbreaks of food poisoning in England while strains with other patterns in Group III showed a diminished tendency to occur in the stools of patients with dysentery, and might have appeared coincidentally with their presence in the upper respiratory passages, as noted by Williams and associates."[4]

Nineteen of the thirty-two cultures of M. pyogenes from patients with enteritis after receiving antibiotic therapy which were tested for enterotoxin by Surgalla and Dack[1] were bacteriophage-typed by Dr. George Jackson of the University of Illinois College of Medicine. Twelve of the nineteen cultures belonged to bacteriophage group III; the other seven could not be typed.

Using the bacteriophage typing to tag strains of M. pyogenes in epidemiologic studies, it appears that the use of antibiotics in hospitals has caused antibiotic-resistant strains of staphylococci to predominate. Patients[6–10] and personnel pick up the antibiotic-resistant strains, and their incidence as determined by bacteriophage typing is much greater than in patients visiting the outpatient departments or from people at home.[3] The bacteriophage group III antibiotic-resistant strains of M. pyogenes, to which the enterotoxin-producing strains belong, predominates over all other groups and is most apt to become antibiotic-resistant. Wallmark[3] studied 1,775 strains in bacteriophage group III and found that no less than 94.3 per cent were resistant to penicillin, whereas in the other bacteriophage-groups only approximately 10 per cent or less of the strains were resistant to penicillin.

Finland[11] has ably pointed out that there is an increase of micrococcic infections in hospitals due to antibiotic-resistant strains. He further stressed the fact that micrococci along with pseudomonas, proteus, aerobacter and candida are notoriously resistant not only to penicillin but also to other antibiotics, whereas antibiotic resistance is lacking in pneumococci, hemolytic streptococci, Hemophilus influenzae, gonococci, meningococci and the Streptococcus viridans from cases of subacute bacterial endocarditis. The resistance of Mycobacterium tuberculosis to streptomycin, para-aminosalicylic acid or isoniazid appears to be mostly confined to strains obtained from patients receiving prolonged and intensive treatment with these drugs.

In considering the problem of pseudomembranous enterocolitis, it has been pointed out that there should be no lack of antibiotic-resistant enterotoxic strains of micrococci in hospitals where there is widespread use of antibiotics. The next problem concerns the enterotoxin and the conditions under which it is produced. Enterotoxin is an exotoxin and may represent more than one antigenic type, so that specific antitoxin would neutralize only the homologous toxin for which it was prepared. Unlike other bacterial toxins, unpurified enterotoxin has been shown to withstand boiling. Bergdoll[12] found that enterotoxin is not dialyzable; it is precipitated by ammonium sulfate and 40 per cent ethanol at $-5°$ to $-10°$C. It is precipitated by acid at pH 3.5 and by zinc acetate, and is considered to be protein in structure. By various procedures, partially purified enterotoxin has been prepared so that as little as 0.005 mg. will cause symptoms in test animals. The molecular weight is estimated to be between 8,000 and 20,000.

The enterotoxigenic micrococci are not toxic in themselves; but when they grow for a few hours, they elaborate enterotoxin. Under certain conditions only four to five hours' incubation has been shown to give rise to enterotoxin production.

The symptoms of micrococcic food poisoning in an experimental volunteer fed 10 ml. of a broth filtrate of an enterotoxigenic culture may be illustrated from a case reported by Denison:[13] "Nausea and vomiting developed 2 hours 45 minutes after drinking the filtrate. Vomiting was severe (5 times in the first hour). There were five liquid stools, 2 containing blood. Pallor was marked, the temperature fell to 96°, and the pulse rose from 84 to 130. Blood pressure fell from 120/80 to 60/40, the white cell count rose to 21,400 with 81 per cent polymorphonuclears. Headache was mild at the onset and of short duration, there were cold sweats, and prostration was severe. There was no abdominal rigidity. Dehydration was moderate but probably did not entirely account for the increased white count. The acute symptoms passed in 4 hours but weakness persisted for 2 days." In contrast to this case resulting from ingestion of a single dose of enterotoxin, the symptoms of micrococcic enteritis persist as long as enterotoxin is produced *in vivo*.

Although enterotoxin in cases of micrococcic food poisoning is produced in the food, if such patients are treated with broad-spectrum antibiotics to which the food strain is resistant, enterotoxin may then be produced *in vivo* causing an exacerbation of symptoms with a severe outcome.

I am familiar with an outbreak of micrococcic food poisoning in which one of the more severely ill patients was treated with large doses of chlortetracycline, after which the symptoms became exaggerated and death occurred on the second day.

Another example illustrating the converse situation occurred in a person with a sore throat who was treated with large doses of streptomycin and penicillin, and had severe gastroenteritis two days later. The cause of the illness was attributed to a food item eaten two hours before symptoms occurred. A careful bacteriologic examination of the item failed to reveal any enterotoxigenic micrococci. In spite of these findings, a medicolegal suit followed involving the food processor.

In cases of micrococcic enteritis following antibiotic therapy, the evidence indicates that the antibiotics used interfere with the normal bacterial populations of the body, allowing antibiotic-resistant micrococci to flourish. In some cases the intestinal tract may contain almost pure cultures of M. pyogenes, and in other cases this organism may be in mixture with other antibiotic-resistant microorganisms. In other cases antibiotic-resistant micrococci may flourish in the respiratory tract. For example, Terplan et al.,[14] in case number 5 of micrococcic gastroenterocolitis, failed to culture enteric pathogens as well as staphylococci from the diarrheic material; yet they found coagulase-positive hemolytic micrococci in exudate from the bronchus and from the bronchioles which were resistant to penicillin, streptomycin, aureomycin and terramycin,® and sensitive to chloramphenicol.

Finland, Grigsby and Haight[15] made an excellent study of micrococcic diarrhea occurring in patients under treatment with oxytetracycline and chlortetracycline. Severe watery diarrhea was significantly greater in patients who were treated with oxytetracycline than in those receiving the same dosage of chlortetracycline. Diarrhea was about twice as frequent among patients receiving 250 mg. doses every four hours or 500 mg. doses every four or six hours than among those given 250 mg. every

six hours. In three of thirty-eight patients treated with oxytetracycline in whom diarrhea developed, no micrococci were found in the stools. In one of these cases the sputum contained large numbers of micrococci; in a second case an abscess contained micrococci, and in the third case micrococci were found in the sputum, urine and in an abscess. In seven of twenty-two patients treated with chlortetracycline in whom diarrhea developed, no micrococci were found in the stoo's but were present in appreciable numbers either in the sputum or throat. From the studies of Terplan et al.[14] and Finland et al.[15] it is evident that enterotoxin produced at sites other than the intestine may give rise to micrococcic enteritis.

In victims of micrococcic food poisoning large numbers of enterotoxin-producing micrococci are ingested with the causative food item, yet these organisms apparently do not multiply and produce more enterotoxin in the body. In fact it is usually futile to examine stools from these patients since few micrococci may be found. The role of normal intestinal bacteria and their effect on the growth of micrococci has not been extensively studied. Furthermore, micrococci introduced into the intestine do not establish themselves as part of the intestinal flora except where antibiotics given have obliterated the normal intestinal flora.

Sugiyama[16] in preliminary laboratory tests found no antibiotic properties for M. pyogenes in six strains of Escherichi coli using the methods described by Levine et al.[17] When two E. coli strains were inoculated into nutrient broth with two enterotoxigenic strains of M. pyogenes, the E. coli strains grew but not the strain of M. pyogenes. More information is needed to elucidate the failure of M. pyogenes to grow in cultures in the presence of the growth of E. coli. Furthermore, without more study it is questionable how far the analogy may be carried between growth of mixed cultures in test tubes with those in the bowel.

Also, much more work is needed to determine the role which antibiotics may play with reference to the predominance of the types of microorganisms found in the tissues. For example, the author has seen penicillin-susceptible strains of hemolytic streptococci and penicillin-susceptible strains of Bacillus anthracis in local lesions in patients receiving penicillin where a penicillinase-producing strain of M. pyogenes var. aureus was present in the same lesions. Tacking[18] has demonstrated a similar effect of penicillinase-producing bacteria on the treatment with penicillin of mixed skin infections in rabbits. In micrococcic enterocolitis following antibiotic treatment there is no evidence that penicillinase plays a role in the disease; however, strains of microorganisms which are inhibited in growth may through the absence of their metabolites or their competition for growth nutrients allow enterotoxigenic strains of micrococci to flourish.

The answer to the question whether antibiotics enhance the growth of antibiotic-resistant micrococci in these cases must await the results of future investigations in this field. Naturally, before the advent of antibiotic therapy enterotoxin-producing strains of micrococci were often encountered in outbreaks of food poisoning, but the evidence accumulating in the literature is strongly suggestive that enterotoxin-producing strains along with non-enterotoxic strains of micrococci are being selectively propagated in hospitals using broad-spectrum antibiotics. Micrococci together with certain other microorganisms have been shown to develop resistance rapidly to new antibiotics which initially were highly effective against them. There is epidemiologic evidence from observations on bacteriophage-typed micrococci that these strains are selectively propagated and infect other patients entering the hospital who are treated with large doses of antibiotics or combinations of antibiotics. Enterotoxin-producing strains of M. pyogenes var. aureus are commonly found among the bacteriophage group III antibiotic-resistant micrococci and are increasing sharply in incidence in patients and personnel. Micrococcic enterotoxin should be considered as the causative agent in patients treated with large doses of antibiotics who subsequently develop enteritis from which large numbers of M. pyogenes var. aureus may be cultured from the stools or other tissues.

REFERENCES

1. Surgalla, M. J. and Dack, G. M. Enterotoxin produced by micrococci from cases of enteritis after antibiotic therapy. *J. A. M. A.*, 158: 649–650, 1955.
2. Wood, J. S., Jr., Bennett, I. L., Jr., and Yardley, J. H. Staphylococcal enterocolitis in chinchillas. *Bull. Johns Hopkins Hosp.* (in press).
3. Wallmark, G. Bacteriophage types, sensitivity to antibiotics and penicillinase production of

Staphylococcus aureus (pyogenes). *Acta soc. Med.*, 59: 209–237, 1954.

4. Williams, R. E. O., Rippon, J. E. and Dowsett, L. M. Bacteriophage typing of strains of Staphylococcus aureus from various sources. *Lancet*, 1: 510–514, 1953.
5. Jackson, G. G., Dowling, H. F. and Lepper, M. H. Bacteriophage typing of staphylococci. *J. Lab. & Clin. Med.*, 44: 29–40, 1954.
6. Goslings, W. R. O., Hien, Tio Liong and Bots, A. W. Infections with antibiotic-resistant staphylococci. Part 1: results of sensitivity tests in staphylococci of various origin. *Acta med. Scandinav.*, 152: 451–458, 1955.
7. Taft, L. I. Recent experiences with staphylococcal infection in childhood. *M. J. Australia*, 2: 970–976, 1955.
8. Brodie, J., Rerr, M. R. and Sommerville. The hospital staphylococcus: a comparison of nasal and faecal carrier states. *Lancet*, 1: 19–20, 1956.
9. Wysham, D. N. Communicable Disease Summary for week ending April 21, 1956; Dept. of Health, Education and Welfare, Public Health Service, National Office of Vital Statistics, U. S. A.
10. Landy, J. J., Benham, R. S. and Havens, I. An outbreak of wound infections due to antibiotic resistant Staphylococcus aureus. *S. Forum*, pp. 814–817, 1956.
11. Finland, M. Guest editorial. *J. A. M. A.*, 158: 188–190, 1955.
12. Bergdoll, M. S. Summarized in: Dack, G. M. Food Poisoning, 3rd Edition. Chicago, 1956, Univ. of Chicago Press.
13. Denison, G. A. Epidemiology and symptomatology of staphylococcus food poisoning; report of recent outbreaks. *Am. J. Pub. Health*, 26: 1168–1175, 1936.
14. Terplan, K. L., Paine, J. E., Sheffer, J., Egam, R. and Lansky, H. Fulminating gastroenterocolitis caused by staphylococci; its apparent connection with antibiotic medication. *Gastroenterology*, 24: 476–509, 1953.
15. Finland, M., Grigsby, M. E. and Haight, T. H. Efficacy and toxicity of oxytetracycline (terramycin) and chlortetracycline (aureomycin). *Arch. Int. Med.*, 93: 23–43, 1954.
16. Sugiyama, H. University of Chicago. (Personal communication.)
17. Levine, M., Enright, J. R., Edgar, K. J., Ching, G. L. and Tanimoto, R. H. Salmonella and salmonella infections. II. Food poisoning; incidence of salmonella and antibiotic coliform bacteria. *Hawaii M. J.*, 14: 205–211, 1955.
18. Tacking, R. Effect of penicillinase-producing bacteria on treatment of mixed infections in rabbits with penicillin. *Acta patb. et microbiol., Scandinav.*, 32: 375–382, 1953.

Management of Postoperative Diarrheas and Infections

FRANK P. FOSTER, M.D. AND JOHN L. DADEY, M.D., *Boston, Massachusetts*

From the Department of Internal Medicine, The Lahey Clinic, Boston, Massachusetts.

THE papers by Dack and Turnbull[1] in this symposium have stressed bacteriologic and clinical features involved in postoperative diarrheas and infections. In addition to our clinical experience we have elected to draw our material from autopsy records and thus present additional findings which are studies in failures to supplement their reports. Four phases will be considered: (1) the current importance of infection as a cause of death, (2) the status of infection in surgery for cancer of the colon, (3) comments on some causes and recognition of postoperative infections, and (4) an analysis of our cases of pseudomembranous enterocolitis.

INFECTION AS CAUSE OF DEATH

The source of our material is the 5,170 autopsy records from the pathology laboratory of the New England Deaconess Hospital consisting of cases largely from that hospital and the New England Baptist Hospital. Protocols were reviewed for the twenty-eight years from 1928 through 1955, permitting division into three nearly equal periods (Fig. 1), the first representing no specific antimicrobial therapy, the second from 1937 to 1946 (the sulfa era), and the third to 1956 (the antibiotic era). That these divisions must include some overlapping in methods of treatment is evident.

Although many factors probably influence the findings, the data suggest that during the first period, without antimicrobial therapy, one-third of the patients died as a result of infection. The number falls to approximately one-quarter during the sulfa era and the current findings in the third or antibiotic era are stabilized at about 14 per cent. Inspection stresses a major lesson from the graph, namely, that for the past six years we have seen no gain in the control of infections resulting in death. Throughout the entire twenty-eight-year period, medical and surgical deaths have been nearly equal except during the sulfa era when the incidence of medical deaths dropped to approximately 40 per cent from the previous average of 50 per cent.

INFECTION IN SURGERY FOR CANCER OF COLON

Cancer of the colon and rectum is a useful disease for the study of postoperative infection because of its special interest to this group. From the 5,170 records we collected 495 cases in which infection was the cause of death when cancer was present in some part of the body. (Fig. 2.) From this group of 495 patients, 185 or 37 per cent died because of infection when cancer was present in the large bowel. This is a high figure indeed, considering that malignancy in this location is only 14 per cent of all cancer reported from this laboratory. This figure is more significant when we note the very modest improvement in results of treatment—9 per cent—that has been made to date since the first records in 1928.

Explanation of this situation is badly needed since with it may come a remedy to improve results in the management of this disease.

FACTORS IN PRODUCTION OF POSTOPERATIVE INFECTIONS

With this brief orientation we wish to discuss some elements that may be important in the production of postoperative infections. Complete coverage is impossible but certain points, particularly in regard to surgery of the colon, are emphasized.

Mental Stress. First may be mentioned the patient's mental state as he approaches surgery. The known and imagined dangers to life

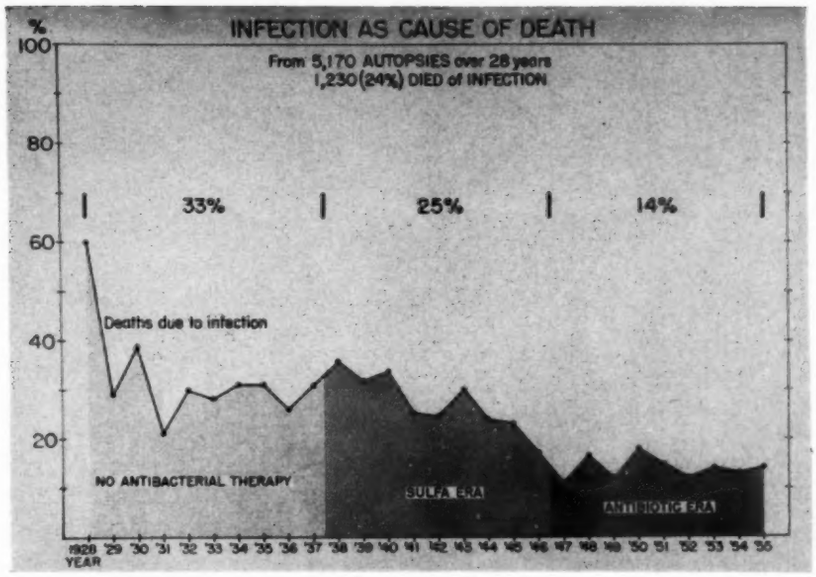


FIG. 1. From 5,170 autopsies over twenty-eight years, 1,230 patients (24 per cent) died of infection.

and the fear of mutilation may, in some at least, induce a state of stress which could be important at or after surgery. Panicky and unduly terrified patients are traditionally uneasy risks.

Damage from the Treated Disease. Next, it must be recalled that the disease for which the surgical procedure will be performed has often taken extensive toll of the patient's powers of resistance. The wasting, anemia, fever, damage to the liver and so on in the presence of cancer of the bowel or in ulcerative colitis are familiar examples. Even when clearly recognized, too often these defects cannot be satisfactorily corrected.

Resistant Bacteria Encountered in Hospital. It must now be accepted that a surgical patient's exposure to significant infection often starts as he enters the hospital. The particular bacteriologic influences of that institution affect him within a short period after his admission. Generous evidence indicates the establishment in hospital communities of an antimicrobial-resistant bacterial population which flourishes in both lay and professional personnel, resulting from the action of the commonly used antibiotics in that institution.[2] The pattern of these resistant organisms will vary from one hospital to another, depending on the drugs in vogue there and the duration of time over which they have been administered. The likelihood that the patient will receive the very drugs which cause the resistance is obviously high unless the danger is realized. The organism of most importance in this connection is the Staphylococcus aureus which shows incredible ingenuity in adapting itself to the locally used antimicrobial agents and great energy in promptly parasitizing newcomers. The reservoir is the hospital building itself and in both visiting and resident personnel, up to 70 per cent of whom may be carriers of antimicrobial-resistant Staph. aureus in the nasopharynx and on the skin. The appearance of these organisms in the patient is not clinically obvious but seems to await some precipitating factor, and the actual state of infection is related to the surgical procedure itself or to some close postoperative factors.

This point touches on a central question in the mechanism of production of infection, namely, what bodily changes permit bacterial invasion? It is noteworthy that the microorganisms, most difficult to control once they become invasive, are most commonly regular inhabitants of the body. The Staph. aureus mentioned and the enteric group including Escherichia coli, pyocyaneus, proteus and others are the most important by frequency and severity of the infections they cause.

Preparation of Bowel. The present day practice of cleansing and disinfection of the bowel seems well accepted, but care in selecting agents and dosage must be exercised. Adminis-

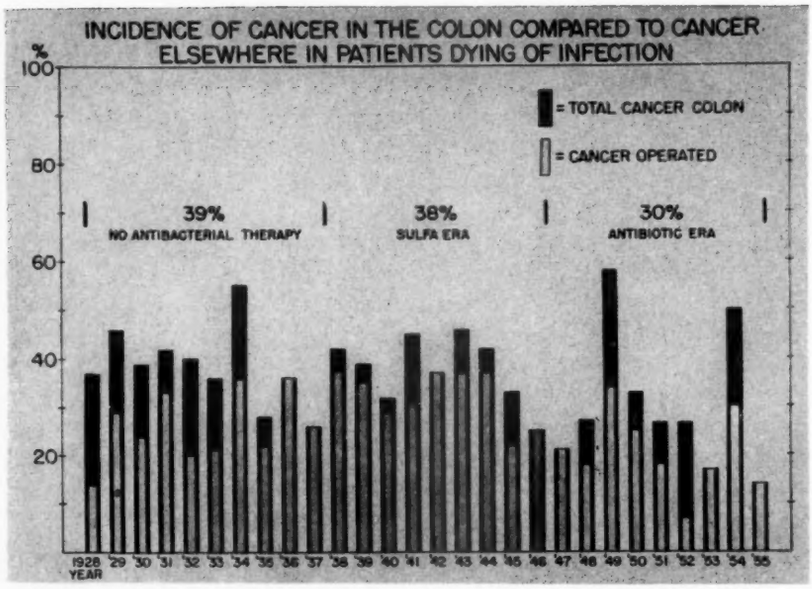


FIG. 2. Of 495 patients dying of infection in whom cancer was present, the cancer was in the large bowel in 185 (37 per cent).

trations of large doses of certain broad-spectrum antibiotics have in the past been associated with unfortunate results manifest by severe diarrheas and some deaths, presumably due to elimination of susceptible bacteria followed with overgrowth of the resistant pathogens.[3] The current combination of neomycin® and one of the sulfa drugs of low absorbability or of neomycin alone does not appear to carry such risk but has diminished value without full cleansing of the bowel.

Spill from the unprepared bowel obviously offers the grossest type of soiling. Efforts at preparation, no matter how long and carefully done, do not guarantee freedom from infection in the presence of gross soiling. Bowel pathogens are successfully reduced under ideal circumstances if time is taken to clean the bowel mechanically with enemas after a non-residue diet has been followed and suitable antimicrobials have been administered.

When complete or partial obstruction is present, adequate disinfection of the bowel can rarely be achieved. Since bacterial invasion is dependent in an important part on the number of organisms released into the peritoneal cavity at any one time, greatest technical skill is then demanded of the surgeon and his team.

Narcotics and Sedatives. The surgical procedure itself may be anticipated, attended or followed with unsuitable amounts of other drugs such as barbiturates or morphine, demerol,® and so forth, given to ease the patient of anxiety and pain and to facilitate the work of both the anesthesiologist and the surgeon. Such drugs prescribed on a routine basis or given in an oversolicitous fashion may produce dangerous results in patients with low tolerance, as is seen in the aged, debilitated or those with poor function of the liver. Interference with adequate circulation and ventilation may result both at and after surgical treatment, with slow return of the cough and swallowing reflexes which may permit bacterial invasion, particularly by way of the respiratory tract.

Contamination through Wound. Actual external contamination through the operative site at the time of surgery may come from operating personnel, the room, dressings, air filtering and so on, increasing generally with the length of time needed from opening to closing of the peritoneum. This is the most important site for direct soiling of the peritoneal cavity with the locally occurring antibiotic-resistant bacteria of the institution which may be reduced by skillful surgery but still remain a constant challenge.

Other Situations for Bacterial Invasion. Still another possible source of infection is the amazing amount of "medical surgery" now performed. We refer to the clyses, cut-downs, alimentary intubations, pulmonary aspirations, laryngoscopic procedures and so on, often done

for days or weeks following surgical treatment. Thus the possibility of carrying nasopharyngeal organisms, particularly Staph. aureus, by intubation into the upper intestinal or respiratory systems is evident. It seems possible that staphylococci and the gram-negative group of pathogens may invade the body through repeated skin and venipunctures. The long-maintained indwelling catheters in large leg veins appear to offer especially favorable situations if located where contamination from rectum or infected wounds is possible.

Specific Sources of Infection. The most obvious source of postoperative infection, namely, intraperitoneal soiling, is now considered. Since the concept has been somewhat neglected, we mention first the possibility that peritoneal contamination results from infection by bacteria within the lesion for which the surgical procedure is performed. Malignant lesions of the colon include tissues with presumed poor antibacterial powers manifest by the presence of infection in deeper portions formed in sinus-like fashion. It is likely that these deep bacterial collections are only slightly affected by the usual antimicrobial agents given by mouth to cleanse the bowel lumen since so small a portion of these agents is absorbed as to provide little or no systemic effect. We suggest that manipulation of the cancerous tissue at surgery, either in its simple removal or in dissecting it from confining adhesions, may result in important local tissue soiling or in lymph and blood stream invasion. We plan studies to attempt to evaluate the importance of this problem in the future.

Recent Important Advances. Two newer concepts related to infections deserve particular emphasis because of their potential importance. First, shock may prove to be a potent force. Fine has shown by animal work that many major antibacterial mechanisms are rendered ineffective after shock for periods up to forty-eight hours. His work was reported at a recent meeting,[4a] at which he presented evidence for these changes following experimental hemorrhagic shock. The phagocytic powers of the polymorphonuclear leukocytes are diminished and mobilization of phagocytes, that is to say the power to transport them to the point of need, is definitely reduced. There is diminished resistance to injected bacterial toxins and the clearing power for intravenously introduced bacteria is diminished. Furthermore, the efficiency of the properdin system may be definitely embarrassed.

In addition, Fine has demonstrated that some animals fail to survive a postshock period even after vigorous treatment. He showed that during shock prolonged for over four hours, toxins coming from enteric organisms in the intestine are not excreted as renal function diminishes. This results in accumulation of toxin which depresses normal vascular tone, and stubborn resistance to antishock therapy follows. In proof he finds that this accumulation of toxin can be influenced to the animal's benefit by pretreatment with such antibiotics as will reduce bacterial growth in the bowel.

Demonstration of the antibacterial power of the properdin system by Pillemer et al.[4b] is the second important advance. Discovered during a search for the mechanism of paroxysmal nocturnal hemoglobinuria, it was found to consist of a combination of euglobulin plus complement and magnesium ions. Together they constitute a vigorous antibacterial force, particularly against gram-negative organisms and pneumococci perhaps by uniting with cell capsules. The system is subject to depletion or exhaustion by various mechanisms including shock, roentgen therapy, damage to the liver and so on, with loss of antibacterial power by the body. Although part of this work is still in the stage of animal investigation, there is hope that with more knowledge of properdin our ability to prevent or treat bacterial infections will be importantly advanced.

A final factor for consideration in the mechanism of infection includes low concentration of gamma globulin, either acquired or congenital, particularly since the condition is amenable to treatment. A damaged liver may be the key in the acquired group while in the congenital type it appears in males early in life, the defect being transmitted through the mother. Decreased levels may be satisfactorily elevated temporarily by parenteral administration of the agent.

DIAGNOSIS OF POSTOPERATIVE INFECTIONS

In recognizing infections we believe there is no substitute for the daily appraisal of the patient by a seasoned, alert clinician, be he internist or surgeon, young or old. A patient's failure to gain in responsiveness, interest, strength and appetite should be reason enough to search for infection when electrolyte upset,

drug excess and the basic disease such as residual cancer can be ruled out. Abdominal distention, lagging or absent peristalsis, pain, nausea and lethargy or confusion, all demand the closest scrutiny and full explanation by clinical and cultural methods.

Temperatures may be deceptive since serious infection may be present with only modest fever. In a review of cases that came to autopsy because of postoperative infections in the years 1952 and 1953, Moore and one of the authors (F. P. F.) found 20 per cent of a small group who never exhibited a fever over 101°F. at any time, yet autopsy demonstrated widespread infection. A tendency to regard fever after the first few postoperative days as a more or less normal occurrence does not, in our belief, represent sound judgment, and it is a source of concern when a sustained rise in temperature occurs during a patient's postoperative course.

Infection a Total Hospital Responsibility. It is vigorously urged that postoperative infections are the responsibility of many persons, not only the surgeon. With good reason the responsibility may be considered as starting with the architect who constructs the hospital so that the dirty laundry chute empties close to the central supply room, and this responsibility continues with a nurse carelessly handling a contaminated dressing cart or the cook's helper with unwashed hands and a furuncle on the neck. All these and too many more to mention tend to maintain and circulate a deadly bacterial population throughout the building.

The medical man is in no way exempt from this responsibility. His often routine prophylactic or prolonged administration of antibiotic drugs has a large share in producing and maintaining the local pattern of bacterial resistance. It is indeed a total hospital responsibility which must be accepted to the last orderly, student nurse and hospital administrator.

With this in mind, we wish to make a final remark on postoperative infections. It is certain that infection will be with us for some time to come; and since success in its management goes with its immediate recognition, the need remains for all concerned to be intensely vigilant for its earliest warnings. Usually the surgeon must be the first to recognize the infection. With his knowledge that he has done everything possible to avoid contamination, it may be somewhat difficult for him to appreciate its earliest signs. It is here that the concept of total hospital responsibility will be a help.

By the time an infection becomes evident the importance lies less in how it happened than in how to treat it with the greatest dispatch. It is our conviction that few postoperative infections need make great trouble if they are stopped in the early stages, since the greatest hazard lies in the process that has acquired considerable momentum before proper therapy is instituted.

PSEUDOMEMBRANOUS ENTEROCOLITIS

Pseudomembranous enterocolitis was first described by Finney[5] over sixty years ago; nine additional authors described 146 cases up to 1940, most of which were reviewed by Penner and Birnheim in 1939.[6] In the following thirteen years, comprising much of the sulfa and earlier antibiotic eras, another eighty-six cases were reported in twelve sources.[7–18] In the past three years 103 more cases were recorded with fifty-two others highly probable,[19–40] clearly suggesting an increased incidence of this disease, a trend with which our data are in full agreement.

Pseudomembranous enterocolitis appears to be chiefly a complication of the postoperative state, but a number of medical conditions (including infections, burns, heavy metal poisoning and uremia) are also reported as associated with it. Possible mechanisms producing the disease include shock, infection, allergy and superinfection following antimicrobial therapy.

Concurrent with this increase in incidence of pseudomembranous enterocolitis are indications of an increasing number of antibiotic-resistant strains of Staph. aureus. Reports by Dack at this meeting and by Dearing,[40] among others, indicate the possibility that the disease is a manifestation of staphylococcal infection and that its symptoms result from the body's reaction to the staphylococcal endotoxin.

Dearing's work indicates that the typical clinical picture may exist without culturable Staph. aureus and that, in addition, Staph. aureus may exist in pure culture in the bowel with characteristic symptoms of staphylococcic enteritis and yet no pseudomembrane may be found. He stresses further the likelihood that the status of the staphylococcal growth in the intestine is not the only determining factor there but that the presence or absence of normal bacterial flora may have an added and

important effect. His findings suggest that as the normal gram-negative bacterial flora diminishes, the intensity of the staphylococcal poisoning may be more intense.

The pathology of the disease is quite well established. Grossly the intestine is typically dilated, containing large quantities of gas and liquid feces, often as much as several liters. The mucosal surface may be covered with a yellow-green or tan, loose pseudomembrane overlying an eroded and congested mucosa. Although any portion of the digestive tract may be involved, the ileum and colon, together or singly, show the lesions most commonly. Microscopically the pseudomembrane is composed of fibrin, leukocytes, disintegrated red blood cells, mucus, epithelial cells and bacterial colonies. The superficial mucosa is necrotic and the subjacent connective tissue is filled with extravasated red blood cells and edema fluid.

Early clinical diagnosis is often difficult because of the paucity of evidence at this time. Not uncommonly, the first evidence is severe shock with or without diarrhea, followed with fever and all too prompt death. Other times the presenting symptoms may include nausea, vomiting, distention, weakness and confusion. This last-mentioned symptom has impressed us so that when there is no drug or metabolic explanation of the situation, a patient in the postoperative state who becomes excited, confused or pugnacious is suspected of having the disease.

The time of onset averages about the fifth postoperative day, but it may occur as early as the second or as late as the fourteenth day. The appearance of the typical cast or of membranous shreds in the fecal discharge is seen late in the disease if at all. Hilsabeck and Dixon[8] commented on the infrequent appearance of diarrhea in their cases, only approximately 30 per cent, whereas in the remainder the loss of fluid was into the bowel lumen with deep shock.

TABLE I
DATES OF OCCURRENCE OF PSEUDOMEMBRANOUS ENTEROCOLITIS

Year	No.
1928	1
1940	1 } No antibiotics used
1947	1
1951	3 (Within 3 mo. of one another)
1952	3
1954	1
1955	2
1956	1 (Medical, no antibiotics used)

TABLE II
ANTIMICROBIAL THERAPY IN PSEUDOMEMBRANOUS ENTEROCOLITIS

4 of 13 patients.....	No antibiotics
Surgical Patients	
3 of 9 patients.....	No antibiotics preoperatively
9 of 9 patients.....	Treated postoperatively

The differential diagnosis includes many of the catastrophic illnesses; coronary thrombosis, pulmonary embolism, hemorrhage, peritonitis, intestinal obstruction and cerebrovascular accident are the most important. Without the passage of a membrane the diagnosis is made from the clinical picture and may be supported by the demonstration of staphylococci in the stools. A Gram stain made on the stool can usually be accomplished promptly and may be of great help when many staphylococci are present.

Analysis of Cases. In summarizing our experience from the 5,170 autopsies, twelve postoperative cases of proved pseudomembranous enterocolitis were found. One medical case was added just before this report in an elderly person suffering from long-standing congestive heart failure who had received no antimicrobial therapy.

It will be noted that only two cases appeared between 1928 and 1940; the remainder, from 1947 to date, are clearly in the era of antibiotic therapy, confirming our impression of the increasing incidence of the disease. (Table I.)

Nine of twelve patients were operated upon for disease in the digestive tract. Five of these patients had cancer, three of which were in the rectum.

In considering the possible role of the antibiotics in causing pseudomembranous enterocolitis, we find that four of the thirteen patients were not given antibiotics; and of the surgical patients who were given antibiotics, three received none before operation. (Table II.)

Three clinical features attracted our attention and are discussed with the thought that they may possibly have contributed to the production of the disease and hence should be borne in mind for future prevention or recognition (Table III): (1) Multiple surgical procedures; in four of the twelve patients, two major surgical procedures had been carried out within sixteen days. (2) Previous drug sensitivity; in three of the nine patients treated with antibiotics, previous sensitivity to these agents had been recorded. (3) Infection established before surgery; of the twelve patients who underwent operation, five were already infected when the procedure was performed.

TABLE III
SOME FACTORS POSSIBLY CONTRIBUTING TO PSEUDOMEMBRANOUS ENTEROCOLITIS

Multiple Surgical Procedures (Two Major Surgical Procedures within Sixteen Days in 4 of 12 Patients)

1. Colostomy plus enterostomy in 4 days
2. Thoracotomy plus thoracoplasty in 16 days
3. Nephrectomy plus resection of rectosigmoid in 10 days (both for carcinoma)
4. Hysterectomy plus esophagectomy in 14 days

Previous Sensitivity to Antibiotics (3 of 9 Patients)

1. Diarrhea after previous aureomycin (thoracotomy)
2. Diarrhea after previous chloromycetin,® streptomycin, penicillin, terramycin® (transmetatarsal amputation)
3. Rash and fever after penicillin (colectomy for chronic ulcerative colitis)

Infection (5 of 12 Patients Infected at Surgery)

1. Pneumonitis (esophagectomy)
2. Bronchiectasis (gastrectomy)
3. Pulmonary tuberculosis (thoracotomy)
4. Pelvic abscess (first stage abdominoperineal resection)
5. Infected gangrene (transmetatarsal amputation)

It would be speculative to attach major importance to one or any combination of these factors, but they may serve as a basis for future observation.

A few of the clinical features warrant further comment. Four of the twelve patients who underwent surgical procedures showed a prompt onset of postoperative fever of 101°F. or more. In previous observation from autopsy records we (Moore and Foster) found that this feature is four times as common in cases of fatal infections as in a control group. The observation extends over only a few years, however, and must be considered as an interesting point only until further study can give it its correct clinical significance.

The course in eight of the twelve surgical cases was characterized by terminal shock and eleven of these patients had more or less severe diarrhea, chiefly terminal.

TABLE IV
BACTERIOLOGIC STUDIES IN PSEUDOMEMBRANOUS ENTEROCOLITIS (GROUP WITHOUT ANTIMICROBIAL THERAPY)

Escherichia coli	1
Esch. coli plus staphylococcus	1
Clostridium histolyticum	1
Staphylococcus (medical)	1

Although not all of these patients were seen by the authors, careful scrutiny of the records indicated that only minimal clinical warning was the rule in most cases. Few patients had fever of more than modest extent until terminally, and some complained of only moderate amounts of abdominal discomfort. Rather consistently, however, particularly in the nurses' notes, remarks were made concerning the patient's confusion, lethargy and occasionally combativeness.

Bacteriologic studies are divided between those patients treated with and without antimicrobial agents. Those without therapy showed in sequence Esch. coli, Esch. coli plus Staph. aureus and Clostridium histolyticum and staphylococcus. (Table IV.) The only case in which the disease did occur in the antibiotic era and in which antimicrobials were not given was the medical death in which a resistant Staph. aureus was easily isolated from the blood stream.

Table V shows the bacteriologic spread in those patients who received antimicrobial agents postoperatively only, and those who received both pre- and postoperative therapy. Except that each shows a considerable number of Staph. aureus, the number in this study is too small to be of significance.

Regarding the antibiotic agents involved, it is clear that no one drug or any combination given before or after operation (Table VI) is responsible for the syndrome. We were hopeful that some characteristic pathologic condition

might be demonstrated in the bowel which could be related to the particular form of treatment that the patient had received. No discernible differences are noted and it might be concluded that once the disease is well established, unsuccessfully administered antibiotics have no influence on the findings at autopsy. (Table VII).

TABLE V
BACTERIOLOGIC STUDIES IN PSEUDOMEMBRANOUS ENTEROCOLITIS (GROUP WITH ANTIMICROBIAL THERAPY)

Postoperative Therapy Only	
Proteus	1
Staphylococcus plus streptococcus plus proteus	1
Staphylococcus plus streptococcus plus proteus plus aerobacter	1
Both Pre- and Postoperative Therapy	
No growth found	2
Staphylococcus plus Escherichia coli	2
Staphylococcus	1
Staphylococcus plus streptococcus	1

TREATMENT

We believe that proper management may be aided first of all by recognition of high risk situations which the surgeon may meet. From this autopsy group and from our clinical experience we suggest that when one or more of the following factors are present, particular care must be taken to detect early evidence of the disease: the presence of cancer, performance of major surgical procedures on the gastrointestinal tract, performance of multiple surgical procedures within two weeks, known previous sensitivities to antibiotics, and previously established infection. When such conditions obtain we believe that very special care should be taken to avoid undue drop in blood pressure during operation and in the immediate postoperative period. Excess sedation before and after surgery must be avoided and we ask our surgeons to try to make special provision for culture at the time the bowel is opened and a final culture of the peritoneum as the abdomen is closed. This may give some picture of potential contaminants in the peritoneal cavity, permitting prompt direct action if infection occurs later.

Regarding the management of pseudomembranous enterocolitis, we have found that the following procedures are useful (Table VIII): First, the condition must be considered to be as acute an emergency as hemorrhage or threatened asphyxiation. The first order written is to stop the antibiotics that are being administered, and the second is designed to replace the tremendous fluid and electrolyte loss that occurs.

TABLE VI
ANTIMICROBIAL THERAPY IN PSEUDOMEMBRANOUS ENTEROCOLITIS

Preoperative Therapy	
Penicillin	1
Aureomycin plus streptomycin	1
Penicillin plus terramycin	1
Neomycin	1
Chloromycetin plus penicillin plus gantrisin®	1
Neomycin plus penicillin plus streptomycin plus gantrisin	1
Postoperative Therapy	
Penicillin plus streptomycin	4
Penicillin plus streptomycin plus terramycin	2
Penicillin	1
Streptomycin	1
Penicillin plus achromycin® plus erythromycin	1

It is often very difficult to estimate the state of the patient's hydration accurately when shock occurs without much diarrhea, since large quantities of fluid may be trapped within the lumen of the intestine.

Our belief is that if we can keep the kidney functioning, toxins will be eliminated and potentially irreversible shock may be avoided. We find that intravenous and subcutaneous administration of saline, glucose and electrolytes, particularly potassium and sodium chloride, is life-saving. Varying with the clinical picture, the administration of 4 L. of fluid is the average initial replacement volume; however, far more is often needed when a great deal of loss is evident. Perhaps the safest practical guide to hydration is to give that amount of fluid which will produce and maintain kidney function at an output of at least 1,000 cc. per day. Care must be exercised when renal function is lost through shock or infection, but we believe that such renal failure is rare when compared to the oliguria and azotemia resulting from dehydration.

Frequent observations are made on the

blood pressure. If the pressure is within normal limits, no vasoconstrictors are given; if it is low or at shock levels, such an agent as levophed® is added to the infusions and the patient is carefully watched to keep the blood pressure as close as possible to his normal levels.

TABLE VII
DISEASE OF BOWEL FOUND IN PSEUDOMEMBRANOUS ENTEROCOLITIS

Without Antimicrobial Therapy	
Membranous colitis	2
Membranous enterocolitis	1
Membranous ileitis	1
With Postoperative Therapy Alone	
Membranous colitis	1
Membranous enteritis	2
With Pre- and Postoperative Therapy	
Membranous enterocolitis	4
Membranous enteritis	1
Membranous colitis	1

A smear of the stools with Gram's stain is done next, and specimens are sent for immediate inspection and later growth and sensitivity. We make it a practice to do blood cultures, and a culture of the wound or sputum has often proved helpful in demonstrating the staphylococcus.

Specific antibiotic therapy is promptly given; intravenously administered erythromycin is usually the drug of choice. We suggest doses of 0.75 gm. twice a day for the first twenty-four hours, reduced to 0.5 gm. twice daily subsequently depending on the clinical response. If there is evidence that the Staph. aureus in the hospital is currently erythromycin-resistant, some other agent can be used. Our choice is chloramphenicol in doses of 2 gm., either intramuscularly or intravenously. Chloramphenicol is an effective agent against Staph. aureus so commonly that we do not fear its dangers as a bone marrow depressant when treating so deadly a disease.

Other agents may be efficient and should not be forgotten. When kidney function is maintained at an adequate level and it is evident that the patient is intensely ill or not responding promptly to the currently administered agent, we have used 2 gm. daily of neomycin intramuscularly. This is divided into four doses for a period of four or five days alone or in addition to either the erythromycin or chloramphenicol; to date there has been no damage to any patient. Neomycin has the advantage, as does chloramphenicol, of often being highly effective against Staph. aureus and many gram-negative organisms, particularly the proteus. Urinary output must never fall below 1,000 cc. in twenty-four hours, nor should the concentration of non-protein nitrogen in the blood exceed 80 mg. per 100 cc. during its use.

TABLE VIII
MANAGEMENT OF PSEUDOMEMBRANOUS ENTEROCOLITIS

1. Regard condition as an acute emergency
2. Stop antibiotics
3. Replace loss of fluid and electrolytes
4. Maintain blood pressure
5. Smear and culture stools; do other cultures
6. Administer erythromycin, chloramphenicol, neomycin, other drugs

The contest is either won or lost within several days, and with the control of infection the major task is to maintain adequate fluid and electrolyte balance as well as to sustain blood pressure to provide for adequate kidney function.

COMMENTS AND SUMMARY

Although there was reduction in the death rate from 34 per cent in the era without antimicrobials to 14 per cent in the antibiotic era, our data show this rate to be nearly unchanged for the past six years. It is presumed that this current stability is the result of the advent of an increasing number of antimicrobial-resistant organisms concentrated in our hospitals.

This situation obtains in spite of new antimicrobials and suggests that until the perfect agent is discovered a better understanding of man's natural powers of resistance is needed and advantage should be taken of the facts that are found. The role of shock and the place of the properdin system are newer examples of such phenomena.

The high incidence of death from infection in persons with cancer of the large bowel is noted, and stress is placed on the dangers from this cause in addition to that of the cancer itself. Of 495 persons with cancer in whom infection was the cause of death, in 185 or 37 per cent the cancer was in the colon or rectum.

A brief review touches on some points which may be causal in postoperative infections.

The patient's normal resistance to infection as modified by his disease and the surgical procedure, and the type and amount of bacteria invading the body appear to be most important. The body's more or less normal bacterial inhabitants often prove to be the most lethal organisms and what factors change such organisms from coexisters to invaders remains a vital question.

The concept is suggested that a postoperative infection may well be, at least in part, a total hospital responsibility and not that of the operator alone. It is hoped that this thought may speed the earlier recognition and treatment of such complications when they occur, and better hospital teamwork will prevent more of them in the future.

Study of the literature and consideration of the cases in our series indicate that pseudomembranous enterocolitis is increasing in frequency, particularly during the past few years.

One may conjecture that this increase results from the concentration of antimicrobial-resistant Staph. aureus in hospitals where major surgery is performed.

Pseudomembranous enterocolitis occurs largely as a postoperative complication and is not necessarily immediately related to antibiotic therapy.

A high degree of suspicion is vital for the recognition of pseudomembranous enterocolitis and the paucity of its reliable early manifestations is stressed.

Recognition of the disease demands emergency action; we believe its danger rivals that of threatened hemorrhage or asphyxiation.

Successful management depends on discontinuance of any antibiotic in use (Table VIII), replacement of fluid and electrolytes, combating of shock and administration of the best antibiotic, usually erythromycin. The occasional value of chloramphenicol and neomycin is noted.

REFERENCES

1. Discussion of symposium on postoperative diarrheas and infections. *Am. J. Surg.*, 92: 783, 1956.
2. (*a*) Wise, R. I., Cranny, C. and Spink, W. W. Epidemiologic studies on antibiotic-resistant strains of Micrococcus pyogenes. *Am. J. Med.*, 20: 176–184, 1956; (*b*) Clough, P. W. Editorial. Resistance of micrococci (staphylococci) to antibiotics. *Ann. Int. Med.*, 42: 954, 1955.
3. Deering, W. H. and Heilman, F. R. Micrococcic (staphylococcic) enteritis as complication of antibiotic therapy: its response to erythromycin. *Proc. Staff Meet., Mayo Clin.*, 28: 121–134, 1953.
4. (*a*) Fine, J. Host resistance to bacteria in traumatic shock. Conference on natural resistance to infections. New York Academy of Sciences, 1956; (*b*) Pillemer, L. Present status of knowledge of properdin system. (Ibid.)
5. Finney, J. M. T. Gastroenterostomy for cicatrizing ulcer of the pylorus. *Bull. Johns Hopkins Hosp.*, 4: 53, 1893.
6. Penner, A. and Birnheim, H. I. Acute postoperative enterocolitis; a study on the pathogenic nature of shock. *Arch. Path.*, 27: 966–983, 1939.
7. Pettet, J. D., Baggenstoss, A. H., Dearing, W. H. and Judd, E. S., Jr. Postoperative pseudomembranous enterocolitis. *Surg., Gynec. & Obst.*, 98: 546–552, 1954.
8. Hilsabeck, J. R. and Dixon, C. F. Treatment of acute postoperative pseudomembranous enterocolitis. *Am. J. Surg.*, 84: 114–117, 1952.
9. Janbon, M., Bertrand, L., Roux, J. and Salvaing, J. Superinfections staphylococcoques de l'intestin et accidents choleriforme de la terramycine. *Bull. Acad. nat. méd.*, 136: 59–60, 1952.
10. Womack, C. K. et al. Terramycin therapy of urinary tract infections. *Arch. Int. Med.*, 89: 240–257, 1952.
11. Reiner, L., Schlesinger, M. J. and Miller, G. M. Pseudomembranous colitis following aureomycin and chloramphenicol. *Arch. Path.*, 54: 39–67, 1952.
12. Meier, F. Postoperativer tödlicher Kreislaufkollaps nach Behandlung mit Terramycin. *Schweiz. med. Wchnschr.*, 82: 1337–1338, 1952.
13. Bernhardt, G. Todesfälle infolge Superinfektionen bei der Antibioticatherapie. *Schweiz. med. Wchnschr.*, 82: 1335–1337, 1952.
14. Gardner, D. L. Aureomycin-resistant staphylococcal enterocolitis; report of two fatal cases. *Lancet*, 2: 1236–1238, 1953.
10. Helmig, H. Cholinformes Syndrom als Komplikation bei Antibioticatherapie. *Schweiz. med. Wchnschr.*, 84: 1382–1385, 1954.
16. Vachon, A., Francillon, J., Chapuis, J. and Grivet, A. Entérocolite aiguë staphylococcique au cours d'un traitement par la terramycine. *Lyon méd.*, 8: 252–256, 1953.
17. Terplan, K. et al. Fulminating gastroenterocolitis caused by staphylococci; its apparent connection with antibiotic medication. *Gastroenterology*, 24: 476–509, 1953.
18. Fairlie, C. W. and Kendall, R. E. Fatal staphylococcus enteritis following penicillin and streptomycin therapy. *J. A. M. A.*, 153: 90–94, 1953.
19. Speare, G. S. Staphylococcus pseudomembranous enterocolitis, a complication of antibiotic therapy. *Am. J. Surg.*, 88: 523–524, 1954.
20. Cayla, A., Perrot, R. and Froideval, P. Sur un cas mortel de colite staphylococcique suraiguë par terramycine. *Bull. méd., Paris*, 68: 415–416, 1954.
21. Nyhus, R. E. and Burke, E. C. Pseudomembranous enterocolitis; medical treatment, with recovery. *Proc. Staff Meet., Mayo Clin.*, 29: 513–517, 1954.

22. KEIDAN, S. E. and SUTHERLAND, I. F. Staphylococcal pseudomembranous enterocolitis. *Lancet*, 2: 1125–1126, 1954.
23. BICKEL, G. and RENTCHNICK, P. Les entérocolites Staphylococciques aiguës de la thérapeutique antibiotique. *Schweiz. med. Wchnschr.*, 84: 311–314, 1954.
24. PROHASKA, J. V., GOVOSTIS, M. C. and TAUBENHAUS, M. Postoperative pseudomembranous enterocolitis; successful treatment with corticotropin (ACTH). *J. A. M. A.*, 154: 320–323, 1954.
25. BEATTY, E. C., JR. and HAWES, C. R. Pseudomembranous enterocolitis in infancy. *J. Pediat.*, 46: 654–662, 1955.
26. HELMER, F. Die akute postoperative Enterokolitis. *Wien. klin. Wchnschr.*, 66: 120–122, 1954.
27. WILLIAMS, E. Staphylococcal pseudomembranous enterocolitis complicating treatment with aureomycin. *Lancet*, 2: 999–1000, 1954.
28. RUMMELHARDT, S. Tödliche Colitis nach antibiotischer Behandlung. *Wien. klin. Wchnschr.*, 67: 450–451, 1955.
29. JONASSEN, O. T., FIERST, S. M. and CINCOTTI, J. J. Management of postoperative pseudomembranous enterocolitis with shock; report of a case with recovery. *New England J. Med.*, 252: 792–797, 1955.
30. DAWSON-EDWARDS, P. and MORRISSEY, D. M. Acute enterocolitis following partial gastrectomy. *Brit. J. Surg.*, 42: 643–650, 1955.
31. WEBBER, B. M. Acute pseudomembranous enterocolitis simulating intra-abdominal hemorrhage. *New York State J. Med.*, 55: 2383–2386, 1955.
32. RENTCHNICK, P. Die akute Staphylokokkenenterokolitis, eine ernste der Antibiotika-Therapie. *Deutsche med. Wchnschr.*, 20: 892–895, 1955.
33. FRIEDELL, G. H. and PAIGE, E. Pseudomembranous enterocolitis following antibiotic therapy for pneumonia: report of a case. *Am. J. Clin. Path.*, 24: 1159–1164, 1954.
34. ALTMAN, S. G. and BRANDT, M. L. A fatal complication of gynecological surgery. *Am. J. Obst. & Gynec.*, 69: 425–428, 1955.
35. GSELL, O. and KESSELRING, F. Letale Staphylokokken-Enterokolitis nach Acromycin. *Deutsche med. Wchnschr.*, 80: 1218–1220, 1955.
36. SANDERS, G. B. and KINNAIRD, D. W. Postoperative pseudomembranous enterocolitis due to staphylococcus. *South. M. J.*, 48: 1226–1231, 1955.
37. CUNINGHAM, J. A. and BEAVEN, D. W. Fatal enterocolitis due to antibiotics; a report of three cases. *New Zealand M. J.*, 54: 644–647, 1955.
38. SCHOLZ, O. Die acute Enterokolitis als postoperative Complikation. *Beitr. klin. Chir.*, 191: 418–426, 1955.
39. TODD, A. S. and HOPPS, P. O. Staphylococcal enteritis; two associated fatal cases. *Lancet*, 2: 749–750, 1955.
40. DEARING, W. H. Staphylococcal enterocolitis. Conference on staphylococcal infections. New York Academy of Sciences, 1956.

Postoperative Staphylococcal Enteritis

RUPERT B. TURNBULL, M.D., *Cleveland, Ohio*

From the Department of Proctology and Colon Surgery of The Cleveland Clinic Foundation, and The Frank E. Bunts Educational Institute, Cleveland, Ohio.

DR. Dack has just described in detail the lethal toxin liberated by Staphylococcus aureus when growing in the human intestine. He has told us that thirty of thirty-three patients with staphylococcal enteritis exhibited a strain of Staph. aureus which produced this toxin; that as little as $\frac{1}{5000}$ mg. of this toxin will cause serious symptoms in laboratory animals. It is little wonder, then, that this disease pursues such a fulminating and lethal course in human beings. Dr. Foster has brought to our attention the fact that any patient entering the hospital may quickly acquire a resistant staphylococcus from his contacts after admission.

I should like to describe the clinical symptoms and signs of staphylococcal enteritis as they occur in the hospital patient. Because this disease pursues such a rapid and lethal course, there is little likelihood that the diagnosis will be made other than by the surgeon in charge of the patient. The time between onset and death may be as short as thirty-six hours; therefore little help can be had from the laboratory. The objective of this report, then, is to present the most common and the earliest symptoms and signs in natural progression, in the hope that the entity will be considered when a patient is not progressing satisfactorily.

CLINICAL SYMPTOMS

Any hospital patient is a candidate for an overwhelming staphylococcal infection of the gastrointestinal tract. However, the majority of these patients are in the postoperative group. The onset of symptoms, as a rule, is between the second and seventh postoperative days. The patients who are most susceptible are those who are in chronic ill health, those who have long been in hospital residence who undergo a second surgical procedure, and those patients who have received wide-spectrum antibiotics over a period of time. Patients having ulcerative colitis who undergo surgery are particularly susceptible under these circumstances; as a matter of fact, nine of the last fifty-one patients undergoing colectomy in this institution have contracted this postoperative malady.

TABLE 1
SIGNS OF STAPHYLOCOCCAL ENTERITIS IN THE ORDER OF THEIR OCCURRENCE

1.	Abdominal sounds
	Diminished → Absent
	Distention (ileus)
2.	Tachycardia
	Fever
	Oliguria
3.	Diarrhea
	Vomiting
4.	Hypotension → shock
	Toxic delirium
	Leukocytosis
5.	Fall in serum proteins
	Anemia

The signs and symptoms represent overwhelming toxemia; the gastrointestinal tract particularly is affected. The systemic effects are profound and rapidly progressive in most cases. Table 1 lists the signs and symptoms in the order of their occurrence. I should like to re-emphasize that these are the very earliest symptoms and signs, and it is at this point that the disease should be suspected and treatment instituted. Although these signs may be confused with other postoperative complications, leaking anastomoses and contamination peritonitis are becoming relatively rare. Actually, the outpouring of fluid from some body opening is the first definite sign that enteritis is in progress. If the stomach and upper small intestine are involved, a large quantity of fluid

will be vomited or will be recovered through a Levin tube. If the lower intestine is involved, the fluid will pour from the rectum in the form of diarrhea. An ileostomy or colostomy will run continuously; as much as 10,000 cc. have been recovered in twenty-four hours. Close inspection will reveal this fluid to be of the "rice-water" type. It consists of thin, yellowish brown fluid containing flecks of mucosa, mucus and pus (exudate). It also contains large amounts of serum albumin. With the sudden and extensive fluid loss, hypotension develops and the patient passes into the so-called "choleriformic state," from which he may not recover.

PATHOGENESIS

As far as we know, some alteration or depression of the flora of the intestinal tract renders hospital patients more susceptible to staphylococcal enteritis. The administration of wide-spectrum antibiotics such as aureomycin or terramycin® has been particularly implicated, but starvation periods or purging the debilitated patient may alter the bacterial antagonisms sufficiently to allow the staphylococcus to grow. These organisms do not grow in the human intestine except in rare instances, but they are perfectly capable of rapid and overwhelming growth when they are not opposed by great numbers of coliform organisms. The staphylococcus usually is resistant to the antibiotics in use in a given locality. In general, penicillin, streptomycin, aureomycin and terramycin are not effective, whereas lesser used antibiotics may be effective. Dr. Foster has pointed out that the most commonly used postoperative drugs (penicillin and streptomycin) are the ones to which the organism is resistant. In any event, the staphylococci begin to multiply in some part of the gastrointestinal tract; but until they produce a sufficient amount of exotoxin, there may be no symptoms. The toxin when present, however, is violent. Its presence in the intestine causes hyperemia, which lowers the circulating blood volume and the urinary output. Locally there is exudate with formation of pseudomembrane and ulceration with slough and massive exudation, which produce the rice-water stool and lower the circulating blood volume still further. As the blood pressure falls, the patient becomes cyanotic because of hemoconcentration. Because of oliguria and other factors, the urea rises; there is leukocytosis and eventually high temperature.

DIAGNOSIS

Recognition of the clinical syndrome just described should be enough justification to start specific treatment. Smears of the exudate will reveal pus and occasionally staphylococci in great numbers. However, in our experience it has been an unreliable method of proving the diagnosis, and only the finding of pus is significant. Specific drugs should be given immediately. Culture reports should not be waited for, since it is imperative to treat during the earliest phase to halt the progression of the disease. Swab cultures made from the rectum, throat and any body opening can be read in twenty-four hours. Besides blood agar, phenethyl alcohol medium should be used. If staphylococcal colonies appear in moderate concentration on blood agar, the patient surely has the disease. Phenethyl alcohol is a selective medium that suppresses coliform organisms, thus allowing the staphylococci to grow more luxuriantly. If cultures are made from the open intestine at the time of surgery or from the rectum just prior to surgery and reveal a pure or almost pure culture of staphylococci, the patient undoubtedly will exhibit the fulminating form of staphylococcic enteritis some time in the postoperative stage. Dearing and Heilman[1] have reported interesting observations along these lines.

TREATMENT

Certain antibiotics not yet in widespread use are effective against the resistant Staph. aureus. These vary with the hospital locality. However, erythromycin has been effective in most localities until recently, and resistant strains are now appearing. Neomycin® is said to be effective. Chloromycetin® is effective, also, since it has not been in widespread use in the past. Albamycin® is definitely effective. The route of administration of these drugs is most important. Since the infection is within the lumen of the bowel in most cases, oral doses should be instituted as soon as possible. The drug should come in direct contact with the staphylococcus. The onset of intestinal ileus, however, will make it impossible to use this route, so that intramuscular or intravenous administration must be utilized. Erythromycin

should be given intravenously initially in doses of 500 mg. every six hours, with gradual reduction. Herrell, Nichols, and Martin[2] have described the use of this drug for infections due to Micrococcus pyogenes. Albamycin may be given intravenously in doses of 750 mg. every eight hours, with gradual reduction.

Occasionally the staphylococcal infection is not within the lumen of the bowel but is at some other site, such as the wound or the peritoneal cavity as an abscess, or as pneumonia or a lung abscess. Even so, pseudomembranous enterocolitis may result although no organisms appear within the lumen of the bowel. Under these conditions and because the site of the infection is not always immediately known, it seems reasonable to start treatment initially with oral and parenteral dosage combined. Treatment schedules usually will not exceed seven days since most cultures are negative by that time.

PREVENTION

We do not think that postoperative micrococcic infections of the gastrointestinal tract can be entirely prevented, but certainly measures may be taken to reduce the incidence. Antibiotics that seriously alter or depress the intestinal flora should be used sparingly. I would make special reference to aureomycin or terramycin, both of which are so effective when given orally that the intestinal flora can be almost completely eliminated. Patients with staphylococcic infections should be isolated until they are sterile. It seems certain that as the newer drugs are introduced and used, resistant strains to these drugs are going to appear. These strains will be available in ever increasing numbers in our hospitals; therefore the threat of lethal postoperative staphylococcal infections will be a continuous one. At the present time a high index of suspicion, early recognition and immediate treatment will do the most to preserve the lives of those patients who have contracted this disease.

REFERENCES

1. Dearing, W. H. and Heilman, F. R. Micrococcic (staphylococcic) enteritis as complication of antibiotic therapy: its response to erythromycin. *Proc. Staff Meet., Mayo Clin.*, 28: 121–134, 1953.
2. Herrell, W. E., Nichols, D. R. and Martin, W. J. Erythromycin for infections due to Micrococcus pyogenes. *J. A. M. A.*, 152: 1601–1606, 1953.

DISCUSSION OF SYMPOSIUM ON POSTOPERATIVE DIARRHEAS AND INFECTIONS

Chairman Neil W. Swinton: We could discuss this topic for a long time. It is a tremendous subject for most of us, certainly for me. We will carry on with questions as long as you wish.

I would like to ask Dr. Turnbull a question which was alluded to by both Dr. Turnbull and Dr. Foster. They brought out the fact that they think these infections arise within the hospital, that they come from the staff, the laundry chute, the patient next door, and so on.

With regard to the staff, Dr. Turnbull, what have you done in your own experience to determine the incidence of staphylococcus carriers, and what has been done about it?

Rupert B. Turnbull: We have done cultures on the surgical personnel who work in the hospital (other men have done that, too), and about 60 per cent of them are carrying resistant strains of staphylococci. So far I do not know what to do about it.

Chairman Swinton: Dr. Foster, one question which has not been brought out because of lack of time is the relation of cortisone therapy to this infection. I think all of us would be interested in this question because in many instances one is required to operate on patients who have had cortisone treatment. Do you want to say something further on this subject?

Frank Foster: If the patient has been on cortisone therapy, he probably has to stay on it because he needs it. If you stop treatment very suddenly, you may have very bad consequences.

If we may assume that the patient has received cortisone because he has undergone extirpation of the adrenal gland or has Addison's disease, he certainly must get cortisone and probably a little bit more.

Do you want me to twist the question and say what I think about the use of cortisone treatment?

Chairman Swinton: Yes.

Dr. Foster: That is an immensely important question. There is a considerable body of literature which suggests that the administration of cortisone in severe infections results in improvement or possibly cure. There must be eight or ten papers in the literature today in which the coincident administration of cortisone and recovery are causally associated.

To my knowledge no information is available which proves that the association is actually causal. On the other hand, there is an immense amount of information (based on experimental work) to indicate that the administration of cortisone during an infection diminishes the ability of the damaged cell to react to that damage.

Experimentally, bacteria can be injected into an animal that is being given cortisone, and all that

happens is that the bacteria go right on by and approximately four days later the cells are dead. The bacteria, instead of being stopped where they should be, proceed further, and in the main there is an extension of the disease process and necrosis of the cells. Actually, the cortisone has robbed the cell of its ability to react, which, in my opinion at least, is an undesirable factor.

CHAIRMAN SWINTON: I have a problem in my own neighborhood. My friends, and even members of my own family, are apt to go to general practitioners and get a shot of penicillin every time they cough or sneeze. What do you think of that, Dr. Foster?

DR. FOSTER: What do I think about a shot of penicillin for a cough or sneeze? I do not think it is indicated.

CHAIRMAN SWINTON: Dr. Dack, do you believe that there is a type of individual who can be a carrier? Is there anything that determines who will be a staphylococcus carrier?

G. M. DACK: There is nothing particular. If we look back through some of the clinical records of years ago, gastroenterologists very commonly found that sometimes patients convalescing from colds would have diarrhea and vomiting. I have often wondered whether some of those illnesses might have been caused by staphylococcal enterotoxin. One thing we know is that the purulent secretions of the nose are very rich in staphylococci.

CHAIRMAN SWINTON: Dr. Turnbull, all of us here are interested in anorectal work, and in recent years we have all seen some very troublesome cases with local symptoms—burning, irritation. Usually these patients give a history of having had a cold three or four months earlier and of having been given terramycin or some other antibiotic. Do you wish to say a word about this?

DR. TURNBULL: This type of case is very common. I am sure everybody here has this as one of the big problems in practice. Patients always seem to receive a little dose of terramycin or chloromycetin, four or five capsules, and seem to get pruritus from it. I do not know exactly how to treat this condition effectively.

CHAIRMAN SWINTON: Dr. Foster, do you have anything to suggest in the way of treatment of these conditions?

DR. FOSTER: No, sir.

CHAIRMAN SWINTON: I might say that I see a great many of these cases. Regardless of their gastrointestinal symptoms, I put these patients on a very strict, bland, non-allergic, non-irritating diet, giving them small amounts of tincture of belladonna and phenobarbital, which helps many of them.

DR. FOSTER: I think some of the people who complain of this symptom are apt to be rather tense and nervous persons. Not a few of them are air swallowers, and the inevitable result of their swallowing air is passing it by rectum. Itching can be prolonged by the person who has passed a little digestive juice along with it, which is extremely irritating and which in my experience seems to continue the local irritation.

CHAIRMAN SWINTON: I would like to ask Dr. Turnbull one or two questions on a case of my own. This man came to us because of a tumor high in the rectum which clinically looked malignant without biopsy. The patient was referred to us because he had a kidney shadow, found on a routine barium enema, which worried the examiners.

We studied this man carefully and found that he had a tumor in his kidney which we believed had priority over the tumor in the colon. Nephrectomy was performed. The lesion was a small, round cell carcinoma with probably a reasonable prognosis because of its very small size.

After operation the patient was given prophylactically small amounts of penicillin and streptomycin (which we were using at that time). On the tenth day I performed resection of the colon. The patient was not given any chemotherapy after this procedure. I might add that his bowel had been prepared with sulfathalidine® and neomycin for thirty-six hours before the operation.

I could not help but think of your charts in relation to this patient. He had a rapid pulse. He was a little pugnacious and irritable for seven days but his bowel began to function and he seemed to be all right. I saw him at 5 P.M.; he was irritable and wanted to fight, as Dr. Foster mentioned. He complained about everything.

Because of the rapid pulse I was worried that he was going to have an embolism. We went over his legs for the third time that day and could not find anything wrong. At 7 P.M. I was told that the patient had gone into extreme shock; blood pressure reading and pulse could not be obtained. He died in twenty-four hours, with very much the same picture that we have seen here.

Dr. Turnbull, would you like to comment on what we did wrong with this patient?

DR. TURNBULL: First of all, Dr. Foster has pointed out that a second operation on the same hospital visit is bad. You bring the patient to the hospital, shake hands with him, and give him the local bacterial population which is resistant to antibiotics (while he gives up his own). He then undergoes surgery and everything progresses nicely for a while. During the ensuing ten days he acquires a resistant staphylococcus and then has an operation on his intestinal tract, followed with staphylococcal enteritis. The incidence of this disease is highest after intestinal operations. The surgical procedure lowers the resistance or at least accelerates the growth of organisms, resulting in fulminating enteritis. To circumvent these events,

you might avoid the second operation until the patient's resistance is higher. Even if he has carcinoma of the colon, three or four weeks' delay would not alter the prognosis. Before you perform the second operation, you should culture by rectal swabs (specifically for staphylococcus); and at operation, as you pointed out, the open intestine should be cultured, too. If you find a predominant coagulase-positive staphylococcic population on the cultures, treat the patient with an appropriate antibiotic before micrococcic enteritis develops.

CHAIRMAN SWINTON: I hate to have treatment of a malignancy delayed for a month. Do you really think that is the thing to do?

DR. TURNBULL: Yes. The malignancy has perhaps been there for a year or more, and another month is not going to make much difference.

CHAIRMAN SWINTON: Dr. Dack, do all strains of Staphylococcus aureus produce enterotoxin?

DR. DACK: Some of the strains do produce it and others do not. There is no very simple way we can tell which do and which do not.

The method for demonstrating enterotoxin is to grow the organism and then feed the culture or filtrate to monkeys and see whether they vomit. If you feed monkeys a few times, they will become resistant. Any work done in that way requires a lot of animals.

We are hoping that before long we will have some tests so that we can more easily say, "This is an enterotoxin-producing strain, or it is not," but we have not reached that point as yet. We have done a lot of purification work, and we hope, using serologic methods, to tell whether or not they do produce enterotoxin. That is something for the future.

One thing I would like to say with reference to erythromycin is that you do not want to be led too far astray in accepting any one antibiotic for staphylococci. For example, if you introduce a new antibiotic in the hospital and you use it very commonly, it will not be long before you will be raising a new crop of staphylococci that are resistant to that antibiotic. In one hospital where erythromycin was used quite a little, at first all of the staphylococcal strains were susceptible; but after it was used for a period, it was not long before 30 per cent of the strains isolated from the throats of patients in the hospital were resistant to the erythromycin.

CHAIRMAN SWINTON: Dr. Dack, do you think it is advisable in any hospital to review periodically the antibiotic agents that are being used and consider changing them arbitrarily?

DR. DACK: I think it is advisable. I am not a clinician, so I am speaking out of turn; however, in looking for ways to combat this problem, I would think that if we could restrict the use of antibiotics as much as possible—only to those cases in which they are needed—it would be of great help.

I know of one hospital where some of the interns and residents had forgotten about aseptic surgery. They were accustomed to using antibiotics for everything. Then they started having trouble with some wound infections. One of their patients was in the hospital for forty days with a wound infected with an antibiotic-resistant staphylococcic strain. As a result, the hospital gave considerable thought to the whole problem and they began restricting the use of antibiotics as much as they could. It is always well to have a few antibiotics that you save for special situations. I would put erythromycin and chloramphenicol in that category. I think they have a very definite, useful purpose.

CHAIRMAN SWINTON: Would you use erythromycin or think it would be of any advantage in the preoperative preparation of these patients?

DR. DACK: Again, if erythromycin is used generally in a hospital, very soon there will be strains that are resistant to it.

CHAIRMAN SWINTON: Dr. Foster, you talked a bit about surgical technic. You are an internist, so you can look at us from the other side of the tracks.

You mentioned laundry chutes and other things as factors in infection. Do you want to give us a little more detail concerning what you think we might do about dressing carts and masks, and other things that we perhaps have forgotten?

DR. FOSTER: I am probably the only internist here, and for that reason I am the least qualified. I can quote some figures that will be published not too long from now by Dr. Howe of the Boston City Hospital, who took a group of men in his hospital and hounded them into doing extraordinarily meticulous work. The others continued to work as they had been.

Dr. Howe had very close to a reduction of 50 per cent incidence in postoperative infections. There is no question but that technic is vital. Anything that we can do to lessen the number of bacteria that get into the body is of tremendous importance.

I would like to hear if Dr. Dack believes this quantitative proposition is of some importance. I rather think the body can handle X number of bacteria; but when it gets X plus Y, I do not believe the body can handle them.

In other words, we should lessen the number to an absolute minimum by scrubbing and doing what Dr. Howe has done (that is, having every dirty dressing covered immediately with a big sheet, wrapped up and autoclaved before it is opened again). It is this kind of meticulous technic—changing masks, double masking, extra-long scrubbing—which is good for the patient and which will eliminate bacteria.

Dr. Howe and co-workers have simply reviewed

the whole matter of good aseptic technic, and their response has been very definite. Dr. Dack, is this quantitative proposition right? If we keep the number of bacteria in the body to a minimum, can't the body handle quite a number?

DR. DACK: I am very sure of it. I have had a good deal of experience along that line. Dosage is an extremely important thing.

Also, if you did not have such wide usage of all of the antibiotics, you would probably have in reserve some antibiotics that would be effective against staphylococci. For example, by widespread use of these drugs we actually select and breed organisms that are unusually pathogenic.

I recently saw a clinician from Geneva, Switzerland, who reported having a lot of trouble with pulmonary staphylococcic infections, particularly in a hospital where large quantities of antibiotics have been used.

Another thing that I think it is well to point out here is that the mode of action of this enterotoxin is not local on the intestine. It seems to act on the central nervous system. Identically the same kind of symptoms are obtained if this enterotoxin is given intravenously or intraperitoneally, as by feeding.

CHAIRMAN SWINTON: In concluding this symposium, I do want to thank Drs. Turnbull, Foster and Dack on behalf of all of us, for their excellent presentations.

SYMPOSIUM ON PHYSICAL AGENTS USED IN TREATMENT OF ANORECTAL DISEASES

Radium and X-rays in the Treatment of Malignant and Benign Proctologic Diseases

PAUL W. SCANLON, M.D., *Rochester, Minnesota*

From the Section of Therapeutic Radiology, Mayo Clinic, Rochester, Minnesota.

ANY discussion of proctologic radiotherapy must of necessity be concerned primarily with palliation, since few proctologic conditions requiring such therapy are radiocurable.

MALIGNANT LESIONS

The treatment of inoperable or recurrent malignant lesions of the rectum and rectosigmoid depends to a great extent on the philosophy of the radiotherapist and his personal concept of the value of palliation. Many radiotherapists consider that the radiocurability of these lesions is so low that they would prefer not to treat any of them, or that the dose required, even for palliation, is so great that the ensuing radiation morbidity offsets any palliative advantages to be gained. Consequently, radiotherapy is far from a routine procedure in the management of most inoperable malignant tumors of the rectum and rectosigmoid. However, failure to utilize radiotherapy when it is indicated will deprive a significant number of these inoperable patients of worth while palliation and a few of possible cure. It is easy to become pessimistic about this discouraging group of tumors. However, I believe results would indicate that inoperable patients who have advanced neoplasms are worthy of as much careful attention, time and care as are operable patients whose malignant tumors are at early stages and favorable for surgical removal.

Three methods of radiotherapy may be employed for inoperable or recurrent lesions of the rectum or rectosigmoid: (1) topical application of radium, (2) x-ray therapy and (3) interstitial use of radium or radon seeds (infrequent). The choice of method depends on the palliative end result to be obtained. When reduction in size of a predominantly intraluminal neoplasm, with its attendant bleeding and discharge, is the foremost consideration and when the superficial effect of radium can be employed to advantage, topical application of radium, with or without supplemental roentgen therapy, is usually employed.

Topical Use of Radium. This consists of the direct application of plaques of radium or radon to the surface of the neoplasm, with as many applications as are required for complete coverage of the lesion. Radon gas in metal jackets ordinarily is used rather than radium, solely because of the danger of loss. Despite instruction, patients have disposed of plaques containing radium via the toilet, necessitating extensive salvage operations throughout long lengths of the sewage system. Loss of radon gas by this or other routes is inconsequential.

The two-tube plaque that ordinarily is employed contains radon tubes enclosed in and filtered by 0.5 mm. of silver and 1 mm. of brass, all of which is enclosed in bakelite jackets 1 mm. in thickness and approximately 1.5 by 2.5 cm. in size. When luminal reduction does not permit the introduction of a plaque as large as this, single tubes of similar make-up but

measuring 0.75 by 2.5 cm. occasionally are employed. After administration of preliminary cleansing enemas, the plaques are placed in direct apposition to the surface of the neoplasm and held in place by gauze packs above, below and at the level of the lesion. Slight inconsistencies in the placement of the plaque and minimal motion due to intestinal peristalsis cannot be avoided completely. However, unlike curative radiation, in which minimal overlapping or underlapping of the fields of treatment might prove disastrous with regard to ultimate cure, these variations do not appear to be too important in palliative radiotherapy, in which temporary retardation and control are the principal objectives.

By this method, applications of 300 to 400 millicurie hours afford a surface dose of approximately 5,500 to 7,500 roentgens (r), while the dose at 1 cm. is 1,000 to 1,400 r and that at 3 cm. decreases to 200 to 270 r. This scheme of dosage applies only to patients who do not have colonic stomas, in whom maintenance of the integrity of intestinal function is necessary. In the presence of colonic stomas, when cicatricial stenosis of the intestinal segments is of little importance, doses of 400 to 600 millicurie hours per area are attained easily, affording surface doses of 7,500 to almost 11,500 r.

The extremely superficial effects of topical application of radium play an important part in the use of palliative radiotherapy. When reduction in size of an exuberant cauliflower-like intraluminal neoplasm, diminution of bleeding or copious discharge from necrosis and breakdown, or the possible closing over of a painful infected ulcerated neoplasm is the prime objective of the palliative procedure, such a rapid decrease in the relative depth dose from topical use of radium is an asset rather than a detriment. By sparing the deeper layers of the intestinal wall to a considerable extent and the adjacent viscera and soft tissues to an even greater extent, large doses of radiation may be delivered with relative safety to the tissues concerned, while the integrity of the surrounding normal tissues is more or less preserved. Another great advantage of the rapidly diminishing depth dose from radium applied topically is the possibility of repeating the application on numerous occasions.

Many therapists consider that adequate radiation into the surrounding soft tissue is a prime requisite to successful management in such cases, and they attempt by various means to deliver much larger doses into the surrounding perirectal tissues. Consequently, such treatment is limited to a single all-out attempt or, at most, to two or three such attempts. This intensive radiation into the depths, either by use of more centrally placed intraluminal sources in the form of bougies or cylinders or by means of supplemental roentgen therapy, is perfectly valid, providing the morphologic aspects of the neoplasm direct the therapist's attention primarily toward perirectal involvement and providing the limitations of palliative radiotherapy are kept in mind.

Another frequent use of the topical application of radium is the direct placement of radium plaques on the fulgurated bases of small, non-infiltrating polypoid malignant tumors of the lower portion of the rectum. After preliminary fulguration, comparatively large three-tube plaques of radon are applied to the fulgurated base and doses of approximately 11,000 r are administered to the surface, giving a dose of 2,000 r at a depth of 1 cm. The purpose of such therapy is twofold, namely, to apply cancerocidal or curative radiation to the base of the malignant polyp and to curtail or minimize the hemorrhage occasionally associated with fulguration.

Roentgen Therapy. When perirectal extension of a rectal or rectosigmoidal neoplasm (with its attendant pain or impairment of the neighboring viscera or both) is the foremost problem, the main tool of the radiotherapist is wide-field coverage with external roentgen therapy. The palliative results so obtained admittedly are not particularly satisfactory or rewarding, but this is a reflection of the type of tumor treated rather than the method of treatment employed. The patients who receive significant or lasting help from such therapy constitute only a small percentage of the entire number receiving radiation therapy.

Supervoltage therapy, such as that supplied by the cobalt bomb or 2,000,000 volt x-ray machines, may increase the rate of salvage slightly but definite confirmation of this assumption does not exist thus far.

When it is decided to use external roentgen therapy, and this is by no means a routine procedure, tumor doses of 3,000 to 4,000 r with conventional therapy or 4,500 to 5,000 r with supervoltage technics through converging large fields around the pelvis usually are employed.

This is less than the so-called curative level, being approximately three-quarters of a curative dose. It is a far more serious undertaking than is intraluminal use of radium. The much greater severity of the morbidity and post-radiation roentgen reactions and the length of time necessary to complete therapy (namely, fifteen to twenty-five days versus one or two days for topical application of radium), in addition to the slim chance of success, give ample reason for some temerity in undertaking this type of treatment.

I am confident that a significant number of patients who have advanced rectal or recto-sigmoidal carcinoma would benefit more by simple colostomy and medical management alone without resort to radiotherapy. Patients with such far advanced malignant lesions usually are in poor general condition; here, again, the decision for or against treatment depends to a great extent on the therapist's personal evaluation of the merits of palliation. Without a trial of therapy in certain instances, however, such happy exceptions to the rule as the following case most certainly never would come to light.

CASE REPORT

A forty-five year old white farmer was first seen at the Mayo Clinic in October, 1951, because of aching left lower abdominal pain and persistent cutaneous sinuses just above the left iliac crest. In September, 1950, a fluctuant mass had appeared in the left flank associated with pain in this region, fever and loss of weight. The mass was incised by the man's physician and yielded foul pus that continued to drain for approximately two months. Another fluctuant mass was incised and drained in March, 1951, after which the sinus and drainage persisted. In April, 1951, the colon became acutely obstructed, necessitating exploration and establishment of a colonic stoma. A hard, nodular, irregular mass was found in the lower portion of the descending colon; this mass was fixed so solidly to the bony pelvis that removal was not thought feasible. Curettage of the persistent sinus was done at the clinic, and study of tissue so obtained revealed grade 2 adenocarcinoma. It was concluded that the patient had a perforated obstructing carcinoma of the lower part of the descending colon and he was referred for roentgen therapy. A tumor dose of 3,000 r was delivered in twelve days by means of routine roentgen therapy. This constituted a moderately heavy dose in view of the short time involved.

The patient returned in September, 1953, almost two years later, requesting closure of the colonic stoma. In view of the patient's excellent clinical recovery and because of the disappearance of the mass and healing of the sinuses, re-exploration was carried out and failed to reveal any evidence of residual carcinoma. The two blind ends of the colon were mobilized and excised; malignant lesions were not found and intestinal continuity was re-established.

TABLE I

TYPE OF TREATMENT OF RECURRENT CARCINOMA AFTER CONTINENCE-PRESERVING PROCEDURES*

Treatment	Patients	
	No.	Per cent
None†	12	10.3
Radiation	70	60.4
Lesion treated locally	4	3.4
Abdominal exploration	30	25.9
Lesion not resected	13	11.3
Palliative resection	5	4.3
Non-palliative resection	12	10.3

* Reproduced with permission from: BLACK, B. M. and KELLY, A. H. Recurrent carcinoma of the rectum and rectosigmoid. *Arch. Surg.*, 71: 538–542, 1955.

† Recurrent lesion not treated; colonic stoma established in seven cases.

Radiation therapy at the Mayo Clinic plays a principal role in the management of recurrent rectal or rectosigmoidal carcinoma. (Table I.) Study of the five-year survivals shows a worth while salvage rate. (Table II.) Unfortunately, the curability rates do not reflect the real merit of radiation therapy for such conditions, since palliative endeavors rarely can be evaluated in such simplified terms.

Interstitial Therapy. Although the interstitial placement of radon seeds as an alternative to topical application of radium is an acceptable procedure in the management of many small accessible lesions, it is usually not necessary under ordinary circumstances in simple palliative radiotherapy. It is employed most favorably when high dose so-called curative therapy is attempted, as in small, favorably disposed malignant tumors of the anus. Needles containing low intensities of radium element or those containing radioactive cobalt probably are superior sources of interstitial therapy because of the even distribution of the

implanted radioactivity. That such lesions are radiocurable is shown by the favorable five-year survival rates of up to 35 per cent found in the literature, notably the European reports.

At the clinic, as elsewhere in this country at the present time, surgical removal is the mainstay of treatment. However, radiotherapy is resorted to when for some reason the patient is deemed inoperable. A combination of intracavitary and interstitial therapy is employed most advantageously for small, potentially resectable lesions of the anus. My associates and I routinely employ an intracavitary anal dilator containing three 50 mg. tubes of radium, giving approximately 600 mg. hours in two sessions to the entire length of the anal canal. This delivers somewhat in excess of 3,000 r to the surface and more than 1,000 r at a depth of 1 cm. This, of necessity, must be supplemented by interstitially implanted radon seeds averaging 1 millicurie apiece, placed uniformly throughout the lesion and in an adequate surrounding margin. By this means, an additional dose of 5,000 to 6,000 r is delivered uniformly throughout the lesion.

However, when the neoplasm extends much beyond the submucosal layers, implantation of radioactive sources becomes grossly inadequate, the prognosis falls off accordingly and the situation becomes one in which wide-field palliative roentgen or supervoltage therapy should be used. Cure is still possible, but high dose roentgen therapy must be given to an extremely radiovulnerable region of the body, with every prospect of an extremely severe reaction and only a slim chance of effecting a cure. If the therapist is convinced that the extension and ramifications of the neoplasm render even this slim chance impossible, a frank palliative approach to the problem is effected and the dose is reduced, thereby greatly attenuating the radiation-induced morbidity.

TABLE II
SURVIVAL AFTER RADIATION FOR RECURRENT CARCINOMA AFTER CONTINENCE-PRESERVING PROCEDURES*

Interval after Treatment (yr.)	Deaths within Interval	Survived to Beginning of Interval	
		No.	Per cent
0–1	42	70	100.0
1–2	15	28	40.0
2–3	6	13	18.6
3–4	1	7	10.0
4–5	1	6	8.6
5+	1	5	7.1
6 or more	4	4	5.7

* Reproduced with permission from: BLACK, B. M. and KELLY, A. H. Recurrent carcinoma of the rectum and rectosigmoid. *Arch. Surg.*, 71: 538–542, 1955.

TABLE III
SQUAMOUS CELL CARCINOMA OF ANUS: FIVE-YEAR SURVIVAL AFTER TREATMENT*

Treatment	Patients	Five-year Survival (Per cent)
Radiation only	19	31.5
Local removal	9	62.5 (of 8 traced)
Local removal plus radiation	24	33.3
Radical resection	45†	36.3 (of 44 traced)

* Reproduced with permission from: JUDD, E. S., JR. and DETAR, B. E., JR. Squamous-cell carcinoma of the anus: results of treatment. *Surgery*, 37: 220–228, 1955.

† Two hospital deaths: pulmonary embolism and cerebral thrombosis, one each.

To summarize some of the experience with radiation therapy at the clinic, the results of treatment in ninety-seven consecutive cases of squamous cell carcinoma of the anus are illustrated in Table III. This shows that radiation therapy can play an important role in the management of such lesions.

BENIGN CONDITIONS

The use of radiation therapy for benign conditions in the region of the body that is of interest to the proctologist is limited almost entirely to three cutaneous conditions of the perianal and perineal zone, namely, (1) indolent, superficially infected postoperative wounds that have been slow to heal by secondary intention, (2) pruritus ani and pruritus vulvae and (3) simple furuncles or carbuncles.

The method employed routinely in such conditions is roentgen therapy. Much has been said and written regarding the immediate and late deleterious effects of roentgen therapy

when it is employed for benign conditions, and its use under such circumstances has been decried. In the past, disastrous end results undoubtedly have accrued from the indiscriminate use of x-rays by those untrained or unfamiliar in their use, either from accident or from failure to appreciate the cumulative effects of multiple small doses that by themselves would be perfectly safe. However, except for the extremely rare accident that may occur in any well organized department, I consider that strict adherence to the rule of never exceeding the administration of three to four erythema doses to any region during the lifetime of the patient for any benign condition will obviate undesirable late sequelae. Experience at the clinic with hundreds of patients over the years attests to the validity of this safety rule.

It is most gratifying to witness the clearing of indolent chronically infected postoperative perineal and perianal wounds after administration of 75 to 125 r two or three times weekly, using superficial low voltage therapy for a total of three to five such doses. In many cases the purulent discharge ceases, the granulations assume a normal healthy pink appearance and epithelization starts from the edges before the series of treatments is completed. The anti-inflammatory action of roentgen radiation has been known for a long time although it is little understood. Before the advent of the antibiotics and anti-inflammatory agents such as cortisone, x-ray therapy was one of the mainstays in the treatment of many cutaneous and subcutaneous infections and inflammatory conditions; this therapy still remains a valuable adjunct.

Little need be said regarding the use of x-rays for pruritus ani and pruritus vulvae. I agree with the many authorities who deprecate its use in routine cases, realizing that the initial good response, although temporary, paves the way for overtreatment as successive relapses are treated unwisely. Exceptions to the rule occur, however, and in an occasional case in which the lesions are refractory to the usual measures, roentgen therapy sometimes can be employed to advantage. Again, one employs the administration of low dose anti-inflammatory roentgen radiation used superficially, a dose of 75 to 125 r two to three times weekly being given. The response is often dramatic, although the patient should be warned of the dangers of repeated treatment. The same principle of dosage is used for furuncles of the perianal and perineal region, and the results of treatment are assessed in terms of quickened resolution of the foci of infection or the rapidity with which these foci point and become evacuated.

COMMENT AND CONCLUSIONS

In any discussion of palliative procedures it is often impossible to assign concise numerical values to the results obtained and one must speak in terms of generalities. Unlike the end results of curative therapy in which the dividing line can be drawn sharply in terms of five-year survival rates or some such values, the end results of palliation are often nebulous; and it is difficult to evaluate the benefits obtained in terms of possible prolongation of life or, what is perhaps more important, increased comfort for the patient. However, access to such therapy adds immeasurably to the armamentarium of the physician who has to cope with this discouraging array of malignant lesions, and it is hoped that continued close cooperation between proctologists and radiotherapists will lend support to the belief in the value of such measures.

Physical Therapeutic Methods in Anorectal Disease

GORDON M. MARTIN, M.D., *Rochester, Minnesota*

From the Section of Physical Medicine and Rehabilitation, Mayo Clinic and Mayo Foundation, Rochester, Minnesota. The Mayo Foundation is a part of the Graduate School of the University of Minnesota.

PHYSICAL therapeutic measures, when properly used, can prove valuable in the treatment of some anorectal diseases. Among these measures are local applications of heat, which are used to improve circulation, stimulate healing, relieve pain, relax tense muscular tissues and dry macerated or indolent ulcerous areas. However, heat is often poorly used clinically. Desired physiologic effects may not be attained, and undesirable and even deleterious effects may result from improper use of even the simplest methods of applying heat. Such undesirable or inadequate effects can often be traced to improper prescription by the physician or to improper technic on the part of the nurse or physical therapist in carrying out a prescription.

MOIST HEAT

Hot Packs. Early application of heat for several hours daily following certain rectal operations is recommended in standard textbooks on proctologic surgery. Application of hot, moist packs is the simplest and most commonly used form of hydrotherapy. The principal mistake is the tendency to apply packs that are too low in temperature and too wet, and to apply them too infrequently.

Knitted cotton jersey of two to four thicknesses makes a most satisfactory material for packs. These are best heated by steam and should have minimal excess moisture when applied. The packs must be applied quickly at the maximal temperature that is comfortably tolerated (a therapist's slogan is "get a squirm without a burn"). They are covered with a waterproof plastic and a double layer of wool blanket for insulation. The packs cool rapidly to body temperature and should be changed every twenty to thirty minutes.[2] Excessively moist packs may tend to macerate tissue and interfere with wound healing. Sterile hot packs can be applied early after operation and are particularly useful for patients who are confined to bed.

Sitz Bath. The temperature and duration of the sitz bath should be determined by the physician and not by the nurse or patient. The bath should last twenty to thirty minutes. The temperature of the water should be 98° to 100°F. when drawn, and gradually increased to approximately 105°F., as determined by a bath thermometer. A bath at 105°F. provides good vasodilatation in the pelvic and anorectal region, and usually produces erythema of the skin. The sitz bath is frequently prescribed to be used twice daily and can be continued easily by the patient at home as a half bath.

In addition to its usefulness after anorectal operations the hot sitz bath is helpful to patients who have postpartum perineal discomfort, gluteal fibrositis or coccygodynia.

Whirlpool Bath. A whirlpool bath occasionally may be used as a modification of a sitz bath. The patient sits in the whirlpool with the anorectal region in contact with moving water. The gentle "hydromassage" is useful for cleansing postoperative wounds or draining sinuses, and for removing crusts and necrotic tissues. At the same time, the pelvic region is heated as in the sitz bath.

DRY HEAT

Heating Pad. Of the several methods of applying dry heat, the electric heating pad undoubtedly represents the most common one today. It causes many and occasionally serious cutaneous burns. It provides a relatively poorly

penetrating form of heat. Some hospitals actually forbid use of heating pads.

Infrared Lamps. Of several simple, inexpensive and effective sources of infrared energy for radiant heating of tissues, the luminous sources are generally considered to be more effective than the non-luminous carborundum® rod units. A 250 watt tungsten filament bulb with a built-in reflector is satisfactory for a local area. Such a bulb can be used in an ordinary stand lamp or can be placed in a device for clamping to the back of a chair. Heat can be applied with the lamp placed about 18 inches from the exposed skin for thirty minutes two or three times daily. The infrared causes superficial vasodilatation and it may relieve muscular pains and soreness; also, it may hasten healing of excessively moist or macerated wounds.

For superficial drying of wound areas a 100 watt tungsten bulb placed 10 or 12 inches from the wound will supply a small amount of infrared energy. The use of smaller bulbs (25 to 60 watts) in a cradle, at distances of 15 to 20 inches from the wound, mainly serves to keep the bedclothes off the wound, allow air to circulate freely over the area and provide light for easy inspection; any heating effect is negligible.

MEDICAL DIATHERMY

The three main types of medical diathermy now in use are short-wave diathermy, microwave diathermy and ultrasonic diathermy. The most important of these, relative to proctology and anorectal diseases, is short-wave diathermy.

Short-wave Diathermy. Modern short-wave diathermy apparatus must meet the specific wavelength and frequency requirements of the Federal Communications Commission. Operation is permitted on three wavelengths. The two most commonly used frequencies are 13 megacycles and 27 megacycles, which correspond to wavelengths of 23 meters and 11 meters. For internal orificial application, 27 megacycle (11 meter) diathermy is best. For orificial application some manufacturers provide hollow metal electrodes into which a thermometer can be inserted. With either a vaginal or a rectal internal electrode, a condenser pad can be used over the lumbosacral area or a belt electrode can be placed around the waist. The temperature shown by the intraelectrode thermometer indicates the temperature being developed in the tissues adjacent to the internal electrode, since the electrode itself is not heated by the high frequency current but only by conduction from the tissues. Most patients tolerate a temperature of 104° to 106°F. for thirty to sixty minutes.

The rectal electrode with short-wave diathermy is probably the first choice as a source of local heat for painful muscular conditions involving the levator group and adjacent muscles, for some perirectal and pelvic inflammatory processes, for diverticulitis, and for certain rectal strictures for which deep local heat is desirable; however, the apparatus must be used with caution in the presence of dense, ischemic scar tissue.

Most newer short-wave diathermy generators are equipped with a drum applicator as well as an induction cable. Both applicators are superior to condenser pads or air-spaced electrodes. For external heating in the rectal and lumbosacral regions, an induction cable in the form of a pancake coil applied with a spacing of 1 inch of turkish toweling provides satisfactory deep heating. If inadequate spacing or dielectric is used, there is a tendency toward greater heating of the superficial tissues and less heating of the relatively deeper structures. Short-wave diathermy is often useful in patients with coccygodynia and in those with pain and tenderness in the gluteal regions; it is also useful in patients with ischial bursitis and in patients who cannot tolerate a rectal electrode.

Microwave Diathermy. Microwave diathermy that utilizes the radar wavelengths and frequencies has become a satisfactory clinical method of heating deeper tissues. The wavelengths which range from 1 mm. to 1 meter have certain characteristics of those used in short-wave diathermy and also some characteristics of infrared energy. Heating to a depth of 2 to 3 inches in a local region can be attained with any of the three standard directors. Temperatures of more than 104°F. can be developed deep in the quadriceps muscle of man with a twenty-minute application of microwave energy.[3] Probably the most useful applicator is the rectangle-shaped C director. This applicator is placed at a distance of 2 to 3 inches from the skin, and the intensity used is 60 to 80 per cent of the maximal output of the generator.

Microwave diathermy is simple to apply, comfortable to the patient and satisfactory for

heating a localized region. Control of dosage and reproducibility of temperature elevations in tissues are more accurate and more uniform than with short-wave diathermy.[1] Unfortunately, no significant elevations of pelvic temperature have been demonstrated following microwave applications. To date no satisfactory orificial applicators for microwave diathermy are available, but several directors are being developed.

Ultrasonic Diathermy. Apparently, the primary effect of high frequency mechanical waves at approximately 1,000,000 cycles per second, called "ultrasound," is heating, which occurs largely at the interfaces between the different tissue layers. Marked heating of bone, bone marrow and periosteum can occur with very short application of ultrasonic energy.

Ultrasonic diathermy is being used primarily over muscular regions and bursa, and for the treatment of certain amputation stumps. Generally it seems inadvisable to use this type of diathermy over abdominal regions, and to date it apparently has extremely limited usefulness in the pelvic region. At present there seems to be little indication for the use of ultrasonic diathermy in proctologic practice.

Ultraviolet Energy. Ultraviolet energy is of only limited use in the treatment of anorectal diseases. For certain indolent anal and perianal wounds and for healing tuberculous fistulas, relatively large doses applied to the local region may be of value. Ultraviolet energy stimulates granulation and may hasten healing, in part by maintaining active hyperemia. The most useful sources of therapeutic ultraviolet energy are the hot quartz mercury vapor arcs. These are manufactured with either a large quartz tube for application to large areas as in psoriasis, or a small quartz tube in a localizing applicator for use on small surface areas or in fistulous tracts by means of quartz rod conductors. The hot quartz source contains more of the so-called vital or stimulating wavelengths of the ultraviolet spectrum, whereas the cold quartz arcs contain primarily shorter wavelengths which are largely bactericidal.

The hyperemia and erythema produced by ultraviolet energy is due to a chemical rather than a reflex effect. The vasodilatation following ultraviolet treatment is latent or delayed in appearing and lasts twelve to forty-eight hours; this is in contrast to the erythema following infrared treatment which appears almost immediately and ceases soon after treatment is terminated.

When a heavy dose of ultraviolet energy is to be applied to indolent anorectal wounds, the normal skin around the wound must be protected with a layer of petrolatum (vaseline).

TABLE 1
PHYSICAL MEDICINE PRESCRIPTION FOR RECTAL FISTULA

Treatment	Time	Specifications
Ultraviolet: hot quartz mercury vapor lamp; contact rod applicator	2 M.E.D.;* increase to maximum of 15 M.E.D.	Rectal fistula: wall off adjacent skin (petrolatum); contact application; increase by 1 M.E.D. daily

* Minimal erythema dose.

Ultraviolet treatment can be utilized daily and dosage increased rapidly up to as much as fifteen to twenty minimal erythema doses. (Table 1.) It is standard practice to determine the erythema dosage for each ultraviolet lamp, as new lamps vary and output decreases with age. One should know accurately the time required for the lamp to deliver the minimal erythema dose at a given distance and at contact. The prescription should be on the basis of a minimal erythema dose.

TREATMENT OF COCCYGODYNIA AND PIRIFORMIS SYNDROME

A relatively common syndrome characterized by rectal pain, pain on sitting and tenderness in the coccygeal region has been described. The syndrome may or may not be associated with a history of injury to the lower end of the spinal column. Sometimes the pain is referred into the posterior part of the thigh and along the distribution of the sciatic nerve. In most cases proctoscopic examination gives negative results. The position and mobility of the coccyx may be normal, but the levator, coccygeus and piriformis muscles may be tender. Occasionally pressure along the sacrospinous ligament, which is at the postero-superior margin of the coccygeus muscle, will trigger referred pain into the lower extremity. Sometimes this upper border of the coccygeus muscle may feel extremely firm, tense and indurated; small, tender nodules may be felt along the muscle and ligament. Often the consistency and sensitivity of these structures on one side are strikingly different from those on the other.

Many of these patients respond well to intensive physical therapy. Usually one can determine within five days whether a patient will respond. Unfortunately, associated functional aspects often make evaluation of the syndrome and treatment most difficult.

TABLE II
PHYSICAL MEDICINE PRESCRIPTION FOR COCCYGODYNIA WITH PIRIFORMIS SYNDROME

Treatment	Time	Specifications
Short-wave diathermy	30 min. daily	Rectal electrode with lumbosacral pad; rectal temperature 104–106°F.
Massage	5 min. daily	Internal rectal stroking lateral to sacrum and coccyx
Exercise		Gluteal setting, 30 contractions 4 times daily
Short-wave diathermy	30 min. daily	Pancake coil, gluteal area
Massage	10 min. daily	Deep stroking and kneading to low back; emphasis, left gluteal area

Note: Treat 2 times daily. Physician's recheck every 3 days. Home instructions: (1) Hot sitz bath, 20–30 minutes, water temperature to 104°F., 1 time daily; (2) gluteal setting exercises 4 times daily.

The initial course of treatment should include daily short-wave diathermy with a rectal electrode followed with internal massage of the perirectal muscular tissues that originate on the coccyx and lower part of the sacrum and extend laterally toward the tuberosities and spine of the ischium. This massage, well described by Thiele,[4] consists primarily of a stroking movement starting at the midline and moving laterally. The pressure during the massage, which lasts for three to five minutes, should be gradually increased and then decreased. If there is external tenderness, usually medial to the greater trochanter of the femur and over the sciatic notch, external application of short-wave diathermy with a pancake coil followed with deep stroking and kneading massage of the gluteal muscles is also prescribed. The patient is taught to "set" or contract the gluteal muscles consciously and then relax them thirty to forty times, repeating this several times daily. In addition, he is instructed to take a hot sitz bath daily. (Table II.) A sponge-rubber cushion or rubber ring may be used to protect the affected part in sitting.

If definite improvement occurs within the first five or six days, treatment may be continued for ten days to two weeks. Occasionally, complete relief may be obtained in two or three days.

CONCLUSION

Physical therapeutic measures, when employed in any anorectal disease, must be used properly if they are to prove effective. Haphazard, indiscriminate and incorrect application of the various treatments is of no practical value and may even be deleterious.

REFERENCES

1. KOTTKE, F. J., GULLIKSON, G., JR., ERICKSON, H. and HEALY, M. A study of the relative value of long wave diathermy and microwave diathermy for heating the pelvis. *Arch. Phys. Med.*, 36: 137–140, 1955.
2. KRUSEN, E. M., JR., WAKIM, K. G., LEDEN, U. M., MARTIN, G. M. and ELKINS, E. C. Effect of hot packs on peripheral circulation. *Arch. Phys. Med.*, 31: 145–150, 1950.
3. MARTIN, G. M. and HERRICK, J. F. Further evaluation of heating by microwaves and by infrared as used clinically. *J. A. M. A.*, 159: 1286–1287, 1955.
4. THIELE, G. H. Coccygodynia and pain in the superior gluteal region and down the back of the thigh: causation by tonic spasm of the levator ani, coccygeus and piriformis muscles and relief by massage of these muscles. *J. A. M. A.*, 109: 1271–1274, 1937.

DISCUSSION OF SYMPOSIUM ON PHYSICAL AGENTS USED IN TREATMENT OF ANORECTAL DISEASES

PAUL W. SCANLON: The first question is, How do you treat a basal cell cancer of the anus?

Usually this is a surgical problem. If we were to treat the basal cell cancer with radiation therapy, I think we could approach the problem with a little less concern or apprehension, because reportedly basal cell carcinomas are quite radiosensitive. Under the circumstances, I think these lesions can best be treated by the application of the three-tube radium plaque, affording a surface dose of approximately 11,000 r. I think a preferred treatment, of course, would be local excision plus radium to the fulgurated or excised base.

I would approach the problem of squamous cell carcinoma of the anus with a good deal more concern and respect for the problem. I think that treatment of this lesion is a major undertaking which cannot be handled quite so lightly. It requires either topical radium or the use of an intra-anal radium dilator, plus the interstitial placement of radon seeds. The dose required is a good deal higher.

Question: Please comment on the use of x-ray for relief of perineal, sacral and pelvic pain in patients after the Miles operation when positive recognition of malignant growth is not recognized although certainly suspected.

Answer by Dr. Scanlon: That is a rather difficult

question to answer. We have to select one of two types of treatment for such a patient. We might have to approach the problem strictly from a pain-relieving approach, assuming there is no malignancy. In this case we use a very light intermediate voltage therapy with doses of approximately 150 r repeated every other day for a total of three to four such doses.

If we suspect malignancy, the problem is radically different. If we are treating for relief of pain in malignancy, this requires tumor doses in the neighborhood, we believe, of 3,000 to 3,500 r and occasionally 4,000 r. Hence it makes a tremendous difference which basis for treatment you select.

If a non-specific pain is being treated, the problem is very easily approached and with no temerity whatever. It is a simple undertaking and does not bother the patient. The salvage is small but I think it is well worth while. When malignancy is suspected, the problem is very much different and is really a major undertaking radiotherapeutically speaking.

CHAIRMAN J. PEERMAN NESSELROD: Because of the number of very interesting questions, I should like to alternate between Dr. Scanlon and Dr. Martin in order to cover as many of the questions as possible.

Question: How are patients with diverticulitis selected for diathermy treatment?

Answer by Dr. Gordon M. Martin: The majority of those patients who are treated with short-wave diathermy have episodic acute attacks at rather wide intervals and a history of rapidly subsiding attacks. A number are local persons who have ready access to the conservative treatment.

Most of these patients are treated with strict bed rest, bland diet and diathermy usually for approximately four to eight days during the subsidence of the acute attack. We use the pancake coil technic over the pelvis and lower abdomen, giving thirty to forty-five minutes of short-wave diathermy twice daily. Some patients who have abscess formation in the pelvic area and who are not amenable to surgery at the time may be treated with short-wave diathermy using a rectal or vaginal electrode.

Question: Ultrasonic waves under water have been used to soften scars and scar contractures. Would this be dangerous to use on anal warts to shorten the period of softening?

Answer by Dr. Martin: We have had no experience with ultrasound for anal warts. We have used it somewhat experimentally in attempts to soften scar tissue particularly on the hand following tendon surgery and Dupuytren's contracture. We are not convinced that it is superior to other forms of local heat, friction massage and stretching for mobilizing scar tissue.

Question: Following excision of anal warts we follow up the patient with x-ray therapy for recurrence. Would you also use x-ray therapy following operation for condyloma acuminatum?

Answer by Dr. Scanlon: Yes. It is a rather simple undertaking, entailing no radiation morbidity. We do not routinely use the heavy doses that we use for plantar warts, a much more effective treatment simply because of the radiovulnerability of that part of the body and the size of the portal required. I believe the administration of superficial x-ray on the order of 300 to 350 r at one sitting is well worth while.

Question: Would you please describe how to keep a radon seed *in situ* for a bleeding area following polypectomy in the rectal ampulla?

Answer by Dr. Scanlon: We do not use radon seeds for that purpose, nor do I think it is a particularly good idea, because the effective zone of radiation around a radon seed is very limited.

If you are going to use radiation in such a case, you preferably should use a uniform type of radiation distributed over a much larger area than a radon seed would cover. After a polypectomy we routinely use radon three-tube plaques in the rectum, which cover an area of 2.25 by 2.75 cm., giving a much more uniform type of radiation than the radon seed.

Question: Do you believe that x-ray therapy has any value in indolent or infected wounds, and how is it used?

Answer by Dr. Scanlon: Yes, I do believe it is of value. I assume this means any indolent or chronically infected wound. We actually have had experience only in cases of perianal wounds which our proctologic colleagues refer to us. The other surgical specialties have not, to the best of my knowledge, taken advantage of this method of treatment. I doubt that it is necessary in most cases. However, when a lesion has proved refractory to the usual modalities of treatment, I think x-ray therapy is well worth while.

Again, the procedure is simple and entails no morbidity to the patient, and in many instances is very effective in cleaning up the chronically infected, superficial cellulitis which has proved refractory to the usual conservative measures.

Question: What do you mean by the term "fulguration"—electrodesiccation with a monopolar current or with a bipolar current?

Answer by Dr. Nesselrod: I can readily understand the confusion that might result there, because in attempting to look up the proper terminology I found that the usage of the word "fulguration" comes from the Latin "fulgur," which means a "jumping of the spark," and theoretically, at least, no contact between the tip of the fulgurating electrode and the tissues.

Of course, contact can be made, and one often does this in attempting to move a polyp around or

twist it on its pedicle, or exert a little traction by means of the fulgurating tip.

The term "monopolar electrodesiccation," as far as I can determine, is the proper term for "fulguration." There is no secondary electrode, only one electrode, the active point, and it is called electrodesiccation because it has a lesser effect than does electrocoagulation. It can be used, I think, a little more safely.

Destruction of tissue is not quite so extensive as it is with biterminal electrocoagulation, which requires two electrodes. Accordingly, on these findings, by "fulguration" I mean the monopolar electrodesiccation of Oudin.

Question: Having read about some exposure of parts of the cerebrum to ultrasound, supplementing lobotomy by neurosurgeons, could ultrasound applied to the lumbar region possibly damage spinal neural areas?

Answer by Dr. Martin: The work that is being done with ultrasound experimentally in nerve tissue is very interesting. We know that nerve tissue has a high affinity for the ultrasound energy, and it is being used on an experimental basis in animals for determining the effects of very specifically localized lesions. Those localized lesions are being developed by using several sources of ultrasound at one time, beaming the ultrasound energy toward a calculated point in the experimental animal's brain.

Ultrasound for human lobotomy, as far as I know, has not been used as yet. However, in using ultrasound on nerve tissue a portion of the skull is removed before the ultrasound is applied, as the bone would be damaged by and would block effective doses if applied through the skull.

Actually, ultrasound applied by ordinarily accepted therapeutic technics to the lumbar area is not dangerous. We do know that by using stationary technics in experimental animals, paraplegia of an experimental animal can be caused by the ultrasound energy. We know that direct exposure of a peripheral nerve to ultrasound for even a brief period of time can cause complete loss of conduction through the segment of the nerve that is exposed to the ultrasound. Thus we believe that this mode of treatment should be used with considerable caution and by personnel who are familiar with correct technics.

Question: Do you know of any foolproof heating pads?

Answer by Dr. Martin: No. We have not done any real study of heating pads, but as far as we know none is foolproof. We believe that heat lamps are easier to use, safer and less expensive to the patient. The infrared from the lamp is more penetrating. All of the arguments about the heating pad and heat lamp certainly favor the heat lamp as the more useful source of heat for clinical purposes.

Question: What is your radiation formula for anal warts? What is your recurrence rate? What recurrences do you treat, and how?

Answer by Dr. Scanlon: As I said, we radiate those warts that have been primarily fulgurated or treated with podophyllin, and in that case we use a very superficial skin technic, employing 80 kv. x-ray therapy at a 40 cm. skin target distance, half value of 1 mm. of aluminum, and give approximately 300 r.

As a primary method of treatment when the wart has not been previously treated, I would use 130 kv., 40 cm. skin target distance, half value layer of 0.3 mm. copper, and give approximately 400 to 450 r.

In regard to the recurrence rate, I cannot answer that because we do not see enough of these patients to have an accurate idea.

Concerning the treatment of recurrences, we employ the same type of treatment used initially, and then repeat it. Very rarely do we repeat it a third time.

CHAIRMAN NESSELROD: I asked Dr. Scanlon to answer that question first, because the question that has been addressed to me is, "By what have you been embarrassed in the treatment of condylomas?"

I can answer very readily by telling you of a patient who is under my care at the present time. I started treating this man in November because of extensive condylomata acuminata. First I used excision, followed with fulguration of the bases of the resulting wounds. There was some involvement of the rectal mucosa immediately proximal to the dentate margin.

As is usual, I warn these patients about recurrence because these areas are very important and must be watched. I have been watching these ever since. The patient was admitted to the hospital two more times in order for me to take care of the condylomata acuminata under anesthesia. I was unable to keep up with the recurring warts, and enlisted the help of the radiotherapist and the dermatologist.

Podophyllin has been used for some of the warts and glacial acetic acid for some, and I am afraid that the radiotherapist thinks I have been pushing him a little hard. He is objecting for reasons which Dr. Scanlon mentioned previously. These are the reasons for my embarrassment.

Question: How much value does ultraviolet light have in the treatment of anal or perianal tuberculous ulcers?

Answer by Dr. Martin: Several years ago we were seeing quite a number of patients with tuberculous ulcers and fistulas who had been treated surgically and referred for ultraviolet treatment. Most of the wounds seemed to granulate very nicely with daily exposure to fairly high intensity doses of ultra-

violet. In the past it has generally been considered that any type of extrapulmonary tuberculosis could be benefited by the judicious use of ultraviolet treatment. Certainly in the last few years, with the lessening of the incidence of tuberculosis, we have been seeing fewer and fewer of these patients, and it is difficult to give any specific answer as to the real value of ultraviolet therapy. Certainly in the past many have been impressed with the healing of tuberculous wounds and fistulas, and have believed that ultraviolet therapy was beneficial.

DR. SCANLON: I have a question regarding the relief of pain in inoperable carcinoma involving the sphincter area in radiation therapy.

When we were limited to the use of ordinary deep x-ray therapy, the administration of an effective palliative dose of x-ray entailed a quite severe epithelitis around the anus; and consequently the dose was almost uniformly curtailed, well below what one would expect to produce palliative relief of pain.

Recently, since we have had access to cobalt therapy, we are much more inclined to undertake this type of therapy for palliative purposes. The peak ionization from cobalt therapy occurs 4 mm. below the surface of the skin, so we do not produce this severe radiation epithelitis now with cobalt that we did with roentgen therapy.

Then, too, because of improvements in depth dose distribution, we can use cobalt through a single field and can get a very nice uniform dose, particularly in a problem like this. Even though the salvage rate is below what we would like, I definitely think it is a worth while procedure in many cases.

Question: An eighty-two year old white woman was seen and a diagnosis of squamous cell carcinoma of the rectum was made. Findings: stricture at rectum 3 to 4 cm. in length; tumor invasion in all local radii; no inguinal involvement. Treatment: local excision and fulguration to relieve obstruction; topical radium, 75 mg. times 24 hours. Results have been satisfactory for three months. Is further radiation treatment indicated?

Answer by Dr. Scanlon: From the way this question was put, I cannot tell how much radiation therapy the patient has had. You have to know the distribution and filtration and many technical factors, so it is impossible for me to say whether or not this treatment is adequate.

However, I do think that in dealing with a palliative problem like this, as long as results are satisfactory, stick with them. I do not think further treatment would be indicated. Fighting for time, I would wait until recurrence was manifest or obvious and then I would treat the patient again.

Question: Is there any contraindication for the insertion of radon seeds in malignant polyps in the lower sigmoid?

Answer by Dr. Scanlon: I, myself, would say yes. I do not think these lesions should be treated with radon seeds. It takes a very meticulously well planned seed implant to hope to achieve cancerocidal radiation. The sigmoid is not an area that you can implant satisfactorily in that manner, so I doubt that radon seeds are practicable.

Question: Please discuss details of epilation technic in the sacrococcygeal area as an adjunct to treatment of pilonidal sinus disease.

Answer by Dr. Scanlon: I am embarrassed to admit that I have never heard of it. The only time we use x-ray therapy after surgical excision of a pilonidal sinus is when a posterior wound has become superficially infected with chronic cellulitis and is slow to heal. Then, I think, x-ray therapy is well worth a try; however, as far as epilation technic is concerned, I must plead ignorance.

Question: Would you consider radiation of a deep sinus tract following resection for ulcerative colitis? The wound has been excised several times. How would you apply such radiation?

Answer by Dr. Scanlon: We have not had any luck whatever in the roentgen treatment of ulcerative colitis. Regional ileitis in the terminal ileum seems to be an entirely different problem, and in such cases many times we can achieve a very worth while result with roentgen therapy. What the difference is between the two I do not know, but we almost routinely refuse to treat cases of ulcerative colitis.

Like any inflammatory condition for which we use roentgen therapy, it almost always proves futile when the focus of infection persists. In a situation like this I do not think roentgen therapy would be worth anything.

Question: Can you effectively treat condylomas involving the cephalic end of the anal canal, that is, 1 inch above anal verge, with radiation methods?

Answer by Dr. Scanlon: As a primary treatment, I would say no.

CHAIRMAN NESSELROD: I am afraid we shall have to omit the answers to a number of very interesting questions that have been submitted. On the part of the panel and myself I should like to express our gratitude for the opportunity to take part in this program.

Preferred for

precision and performance

BARD-PARKER
RIB-BACK
SURGICAL BLADES

It's Sharp

BARD-PARKER RIB-BACK SURGICAL BLADES are preferred by the Profession . . . because they know that each blade, through continuous inspection—meets every specification.

And, there are other traditionally good reasons why there is a preference for B-P RIB-BACK SURGICAL BLADES . . . they are *always* dependable and highly economical in performance.

Ask your dealer

BARD-PARKER COMPANY, INC.
Danbury **Connecticut, U.S.A.**

For every step in proctological examination and treatment

the Complete No. 318 set by

WELCH ALLYN

Designed to fill every need of the proctologist for examination and treatment—yet so simple and easy to use that it is entirely practical for the GP without extensive proctological training. The new WA Advanced Design "full grip" biopsy forceps is included. Ask your surgical supply dealer to show you this splendid set.

In Montevideo, too, Pentothal serves daily . . .

VIDEO BY ROBERT J. LEE

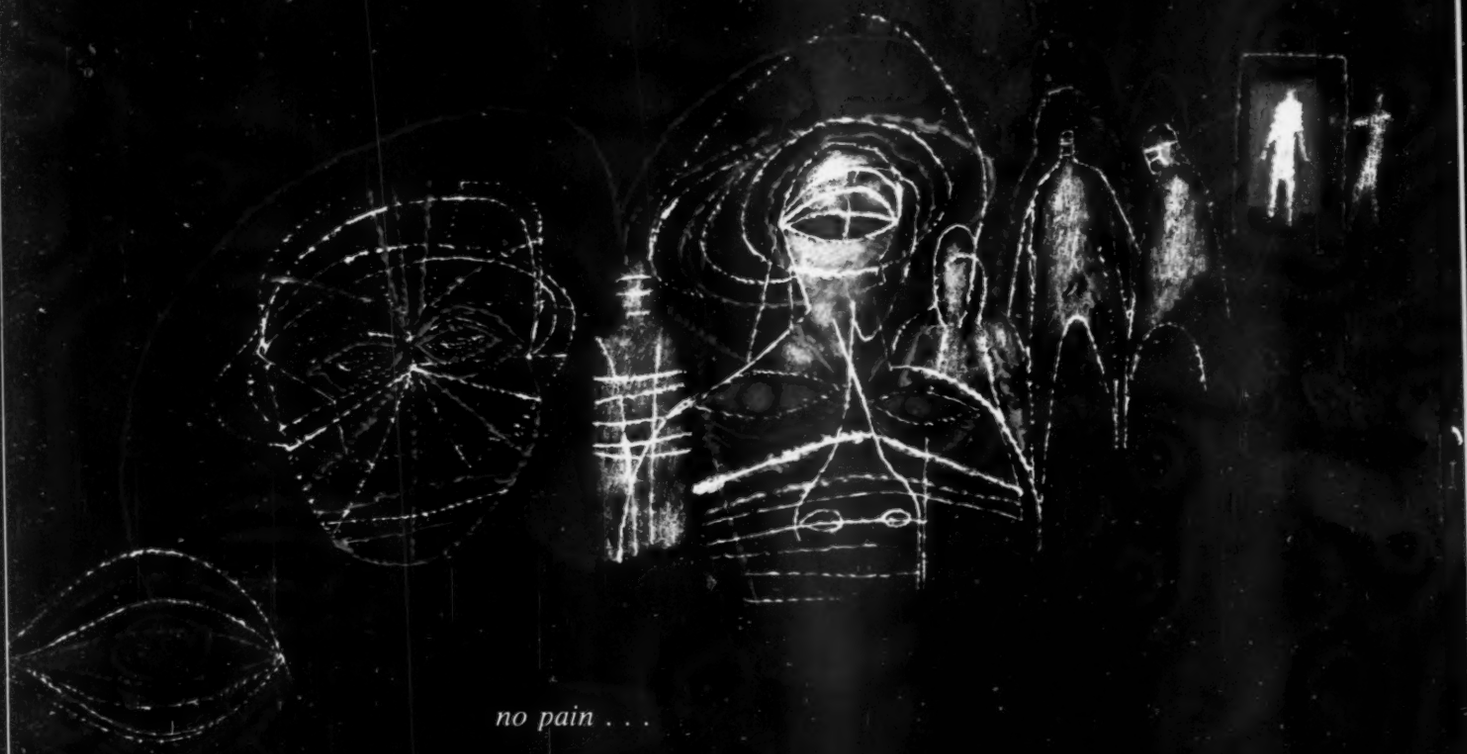
ADDING TO . . . *a clinical record unique in modern intravenous anesthesia*

With more than 2500 published reports and 20 years of use behind it, Pentothal Sodium takes its place among the relatively few drugs that have by long and constant usage become contemporary drug classics. Certainly the world's most widely studied intravenous anesthetic, Pentothal Sodium brings to you a record unsurpassed for safety, effectiveness and versatility of use. You can add your trust to that of clinicians the world over, who, in proclaiming it an agent of choice, have made Pentothal Sodium practically synonymous with modern intravenous anesthesia. Abbott

PENTOTHAL® Sodium

(Thiopental Sodium for Injection, Abbott)

611030



no pain . . .

No Nightmare of Fear

no memory . . .

IN PEDIATRIC ANESTHESIA

To YOU an operating room may be a familiar habitat. But to the pediatric patient, it is a place of "ghosts" . . . strange sights and smells . . . awesome lights . . . a place of terror.

With Pentothal Sodium administered rectally, your pediatric patients are never aware of the operating scene. *Instead, they drop off pleasantly to sleep in their own rooms before surgery—awake there afterward with no memory of the events between.*

The sleep is so similar to normal sleep that no special care is needed, other than quiet, gentle handling. No local irritation will be observed, either—in fact, this method may be used even for those requiring rectal surgery. The safeness and humaneness of Pentothal by rectum has been confirmed by clinical reports on over 4,000 cases. Do you have the literature?

Abbott

611030

PENTOTHAL® Sodium

(Thiopental Sodium, Abbott)

Primum Non Nocere

The primary concern of the dermatologist is embodied in the dictum, "Primum Non Nocere," meaning "*First do no harm.*"[1,2]

A major attribute of Desitin Ointment is its non-sensitizing, non-irritant, non-toxic[4-6] quality even when applied over extensive, raw skin areas. To soothe, protect, lubricate, and accelerate healing ... without causing "therapeutic" or "overtreatment" dermatitis ... rely on

DESITIN®

OINTMENT

rich in **cod liver oil**

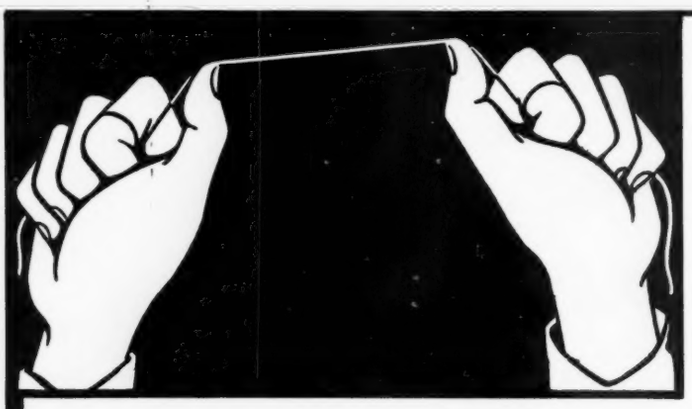
in **diaper rash** • **wounds** (especially slow healing)
ulcers (decubitus, varicose, diabetic) • **burns**
dermatoses • **rectal irritation**

Tubes of 1 oz., 2 oz., 4 oz., and 1 lb. jars.

May we send **samples** *and literature?*

DESITIN CHEMICAL COMPANY • Providence, R.I.

1. Overall, J. C.: Southern M. J. 47:789, 1954. 2. Editorial: New England J. M. 246:111, 1952.
3. Grayzel, H. G., Heimer, C. B., and Grayzel R. W.: New York St. J. M. 53:2233, 1953.
4. Heimer, C. B., Grayzel, H. G., and Kramer, B.: Archives of Pediatrics 68:382, 1951.
5. Behrman, H. T., Combes, F. C., Bobroff, A., and Leviticus, R.: Ind. Med. & Surg. 18:512, 1949.
6. Turell, R.: New York St. J. M. 50:2282, 1950.



Surgeons at recent conventions were invited to make "hand pull" tests of Deknatel Silk. Reactions were epitomized by the comment: "*How do you make it so strong?*"

Through the years the Deknatel Research Staff has made small but significant gains in the strength of the suture. It was felt that we were virtually at the top strength that could be imparted to surgical silk. Our continued efforts prove us to have been much too conservative in assessing tensile strength potentiality. Recent advances have resulted in an increase far above normal expectation.

You need no elaborate technical device to detect the difference . . . a simple "hand pull" test will convince you. We urge comparison. Feel for yourself the *highest tensile strength* that it is now possible to build into a silk suture.

Samples submitted upon request.

Deknatel

Queens Village 29, New York

ROSENBERG-SAMPSON COSTAL CAGE RETRACTOR

for wide angle vision in gastric surgery

This self-retaining retractor features a *powerful* spreading mechanism, and in addition, two spikes on each arm to provide a sure grip and to prevent sliding.

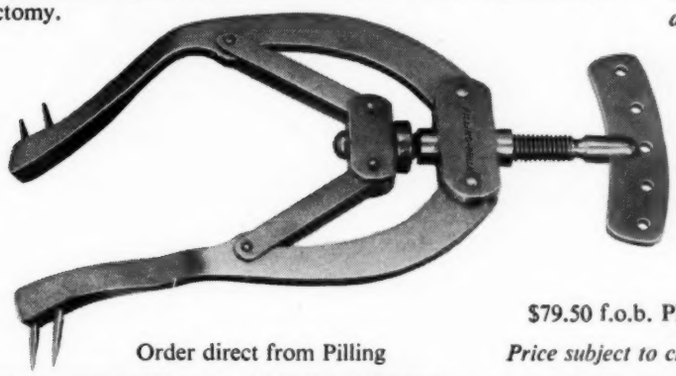
Especially in cases where a narrow angle is present in the costal margin, the retractor provides extremely wide exposure which can be further increased by excision of the xiphoid cartilage, if necessary, for an amazing amount of "working space."

The retractor spikes may be placed extraperitoneally or intraperitoneally, which is often preferable since all the overlying tissue is retracted, without causing any discomfort to the patient after their removal.

Very practical in gastrectomy, this retractor is also of great help in splenectomy.

designed for
S. A. Rosenberg, M.D.
and A. Sampson, M.D.
Pittsburgh

the hallmark of quality PILLING PHILADELPHIA



B 3600

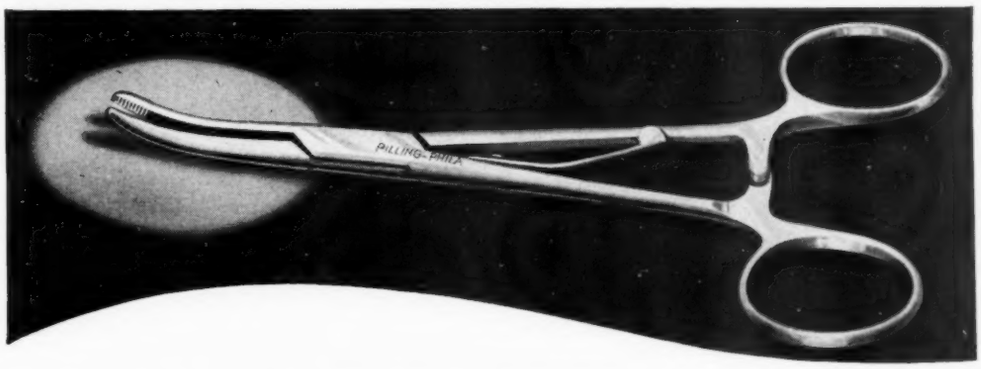
$79.50 f.o.b. Philadelphia

Order direct from Pilling

Price subject to change without notice

GEORGE P. PILLING & SON COMPANY, 3451 WALNUT STREET, PHILADELPHIA

James P. Kelly, 4 W. 56th St., N.Y. 19, N.Y • George S. Weigand, 6220 Oakdale Ave., Woodland Hills, Calif. • Charles H. Dunham, 3043 30th St. S.E., Washington 20, D.C. • CABLE: Surgical, Phila.



Uses "U" clips

or "V" clips

CLIP APPLYING FORCEPS *as modified by John H. Drew, M.D., Boston*

Clips will not stick or jam

In actual operating room use, Drew Forceps

1. entirely eliminate the problem of clips jamming or catching in the jaws of the forceps
2. hold clips more securely—they are not dislodged during transfer from nurse to surgeon
3. are easier to use—with Drew forceps the nurse picks clips off the McKenzie magazine with much less effort or trouble than with the standard forceps.

Write for complete listing of clip applying forceps with Drew jaws.

Ref.: Drew, J.H.: J. Neurosurg. 10:439 (July) 1953.

THE AUTHENTIC INSTRUMENT IS AVAILABLE ONLY FROM PILLING . . . *ORDER DIRECT:*

GEORGE P. **Pilling** & SON CO.

3451 WALNUT STREET . . . . . PHILADELPHIA

NOW

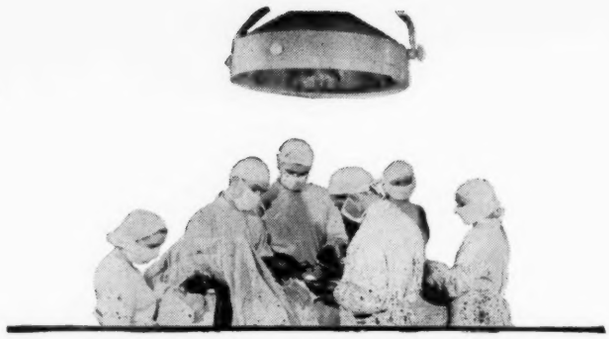
IN PROLONGED SURGICAL

PROCEDURES OF EVERY TYPE

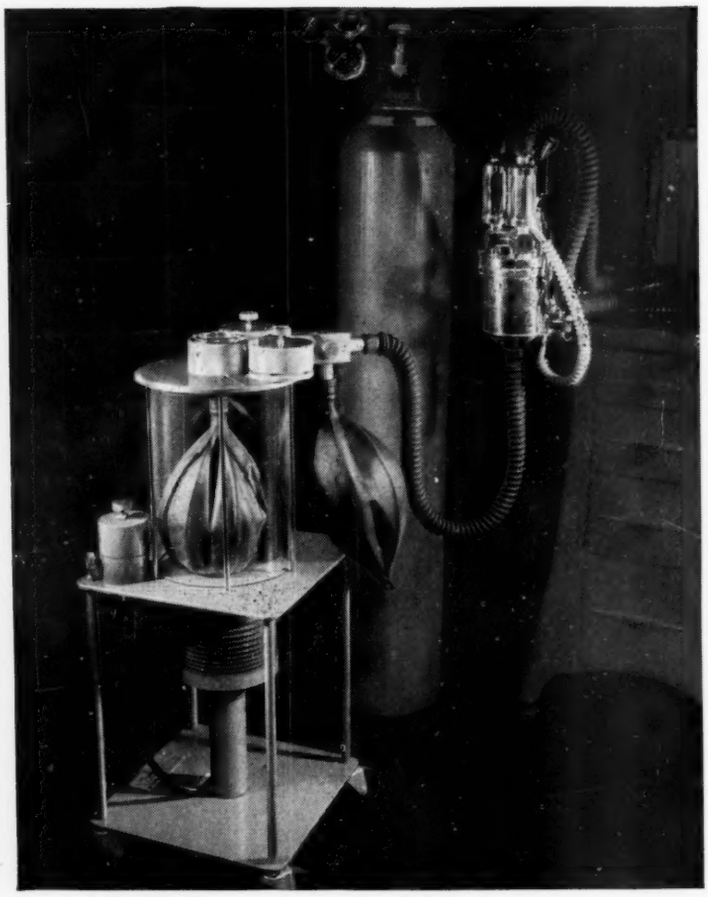
... IN PEDIATRIC SURGERY

... AND PARTICULARLY IN OPEN CHEST

OPERATIONS AND SITUATIONS INVOLVING



the poor-risk surgical patient



THE JEFFERSON VENTILATOR

1. *Automatically* exerts rhythmic, negative-positive pressure for adequate pulmonary ventilation, without circulatory depression;

2. *Helps avoid respiratory acidosis,* maintain proper arterial oxygen-carbon dioxide saturation;

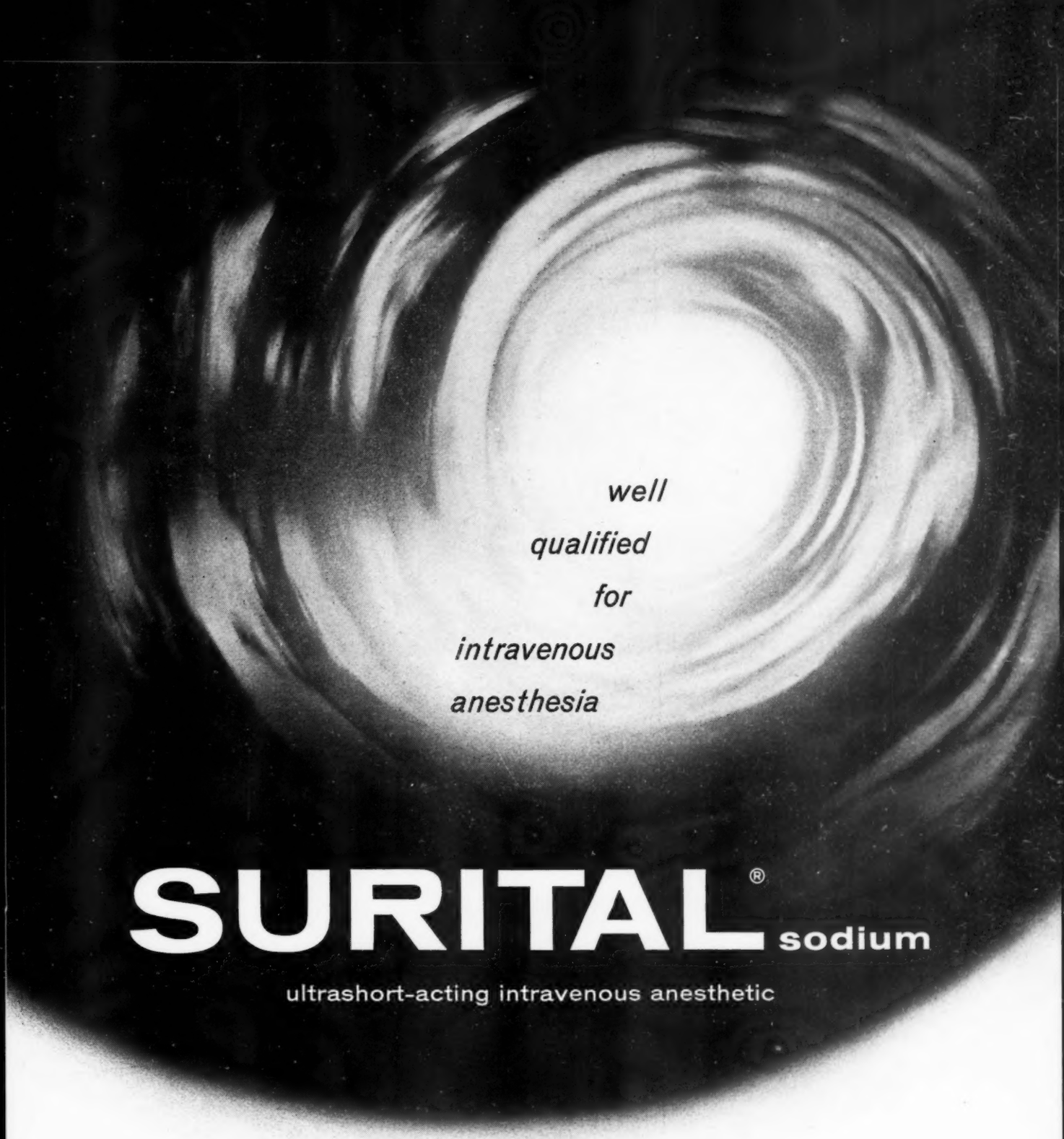
3. *Frees anesthesiologist* for administration of fluids, checking blood pressure, and other vital tasks.

THE JEFFERSON VENTILATOR is a clinically proved, fully automatic, portable device • Pneumatically activated (by air or oxygen, without electrical hazard) • Developed in cooperation with *Jefferson Medical College* • Connects to any closed or semi-closed-circuit anesthesia apparatus • Accommodates automatically to the requirements of the patient • Rebreathing bag may be manually operated • Independent controls for phase, positive pressure, negative pressure, respiration rate • Sold direct • 30-day return-privilege • For orders, reprints, information, phone collect: Hatboro, Pa. OSborne 5-5200.

THE Jefferson Ventilator

TRADEMARK

Manufactured, sold and serviced by **AIR-SHIELDS, INC.** *Hatboro, Pa.*



SURITAL® sodium

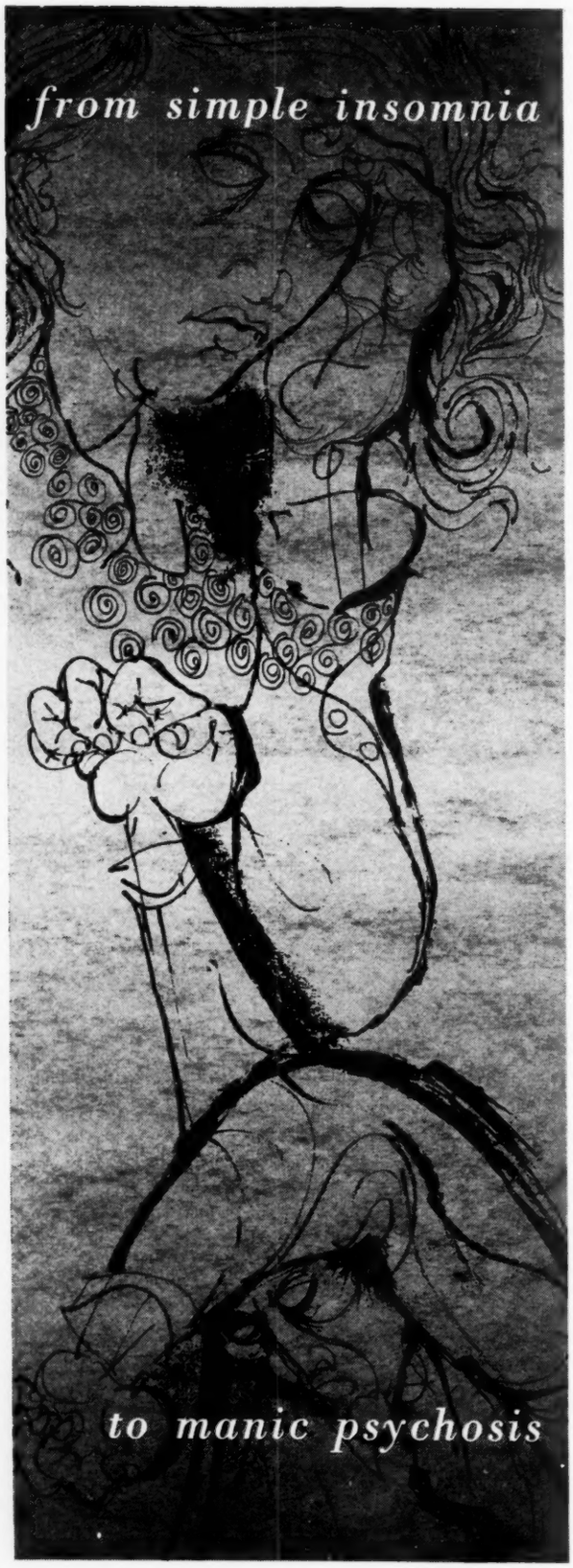
ultrashort-acting intravenous anesthetic

rapid, pleasant induction • uneventful transfer to inhalant anesthesia, if desired • readily controlled surgical plane of anesthesia • minimal interruptions due to laryngospasm or to bronchospasm • prompt recovery, usually without nausea, vomiting, or excitement

Detailed information on SURITAL sodium (thiamylal sodium, Parke-Davis) is available on request.

PARKE, DAVIS & COMPANY
Detroit 32, Michigan

50561



whenever a patient needs prompt, effective sedation . . .

short-acting

Nembutal®

(Pentobarbital, Abbott)

You can achieve any degree of sedation using short-acting Nembutal—usually with only about one-half the dosage of many other barbiturates. This means:

. . . less drug to be inactivated,
. . . shorter duration of effect,
. . . little tendency toward hangover.

And, of course, with short-acting Nembutal you are using a thoroughly studied sedative-hypnotic with a wide margin of safety. Hundreds of clinical reports, more than 26 years of wide medical use stand behind each of your Nembutal prescriptions.

Next time—any time—a sedative or hypnotic is indicated, consider short-acting Nembutal . . . a standard in barbiturate therapy. Abbott

607190

Still workable...

and so are many of our older model BOVIES...

But

...MODERN ENGINEERING SKILLS HAVE DEVISED MANY DISTINCTLY NEW ELECTROSURGICAL ADVANTAGES... ALL TO BE FOUND IN THE NEW

MODEL "AG" Bovie
ELECTROSURGICAL UNIT

The Model "AG" Bovie offers important features not found in any other electrosurgical unit. It's the one and only unit featuring *both* tube and spark-gap cutting, each independent of the other. It gives you four specialized cutting currents. . . . effective hemostasis without current blending . . . completely automatic spark-gap adjustment . . . dependable standardization of power-settings for all techniques. Also available: L-F Explosion-Proof Footswitch. USE THE COUPON AT RIGHT TO OBTAIN BROCHURE FOR YOURSELF OR YOUR HOSPITAL.

Send Coupon

THE LIEBEL-FLARSHEIM CO., CINCINNATI 15, OHIO AJS

Gentlemen:

Please send (without obligation) your latest illustrated brochure on the Model "AG" Bovie Electrosurgical Unit to:

NAME_____

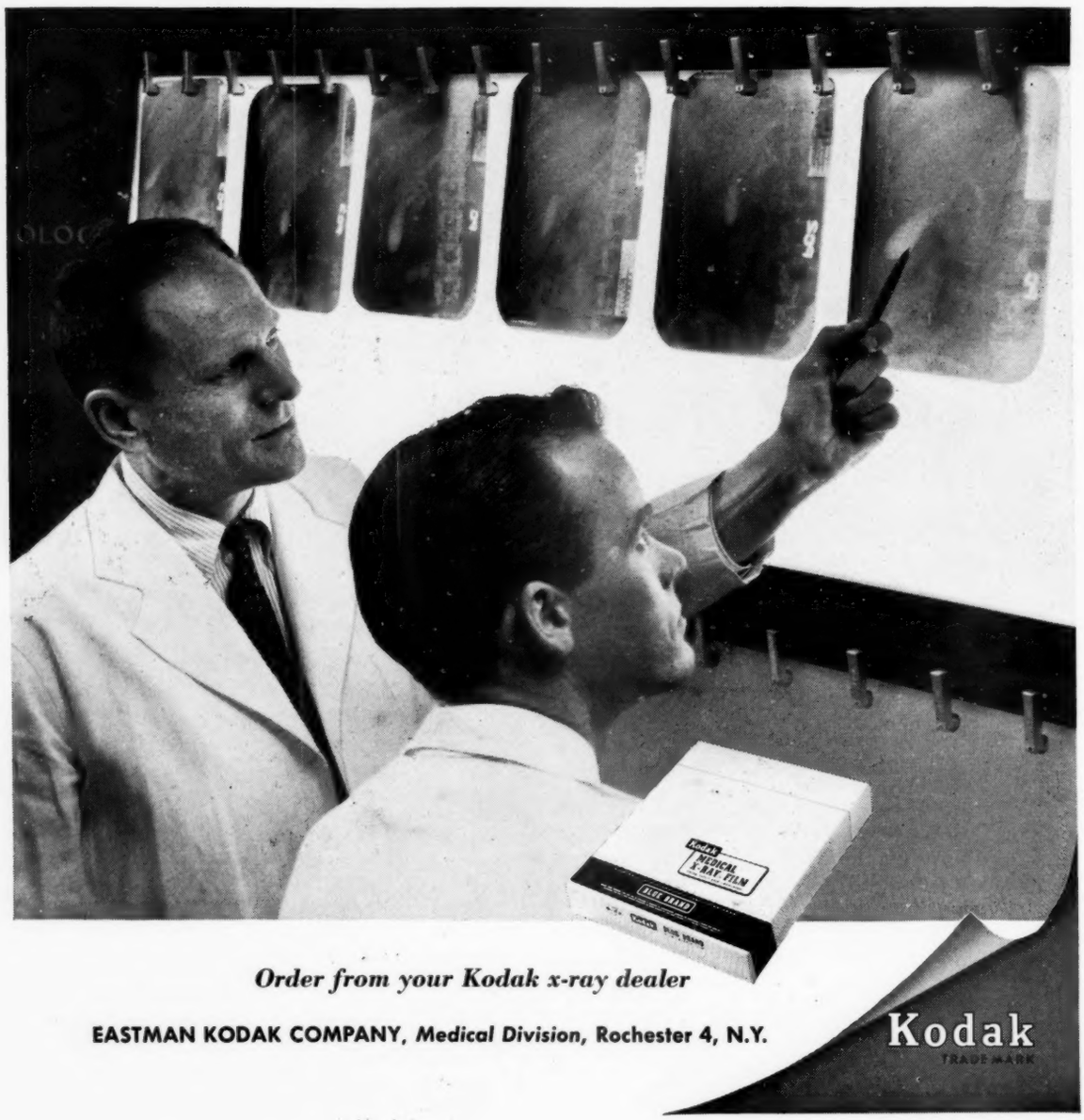
ADDRESS_____

CITY/STATE_____

☐ CHECK HERE if free appraisal of older equipment is wanted.

Have you noticed the high quality of the information that **BLUE BRAND FILM** gives **even** in low density areas . . .

Dependable x-ray film should have the same speed, package after package. Equally important is consistency of contrast. Blue Brand Film provides uniformity of response throughout the entire useful density range—the result of careful manufacturing control.



Order from your Kodak x-ray dealer

EASTMAN KODAK COMPANY, ***Medical Division,*** **Rochester 4, N.Y.**

Kodak
TRADE MARK

XYLOCAINE
HYDROCHLORIDE 1%
with EPINEPHRINE 1:100,000
XYLOCAINE
HYDROCHLORIDE 2%
XYLOCAINE
HYDROCHLORIDE 0.5%
with EPINEPHRINE 1:100,000
XYLOCAINE
HYDROCHLORIDE 2%
with EPINEPHRINE 1:50,000
2cc
ASTRA
to try it .....
XYLOCAINE
DROCHLORIDE 1%
PHARMACEUTICAL PRODUCTS, INC.
WORCESTER 6, MASS., U.S.A.
AQUEOUS SOLUTION
XYLOCAINE
HYDROCHLORIDE 2%
with EPINEPHRINE 1:50,000
XYLOCAINE
HYDROCHLORIDE 1%
ASTRA PHARMACEUTICAL PRODUCTS, INC.
WORCESTER 6, MASS., U.S.A.
XYLOCAINE
HYDROCHLORIDE 1%
ASTRA
with EPINEPHRINE 1:100,000

fastest acting local anesthetic— as safe as it is effective

How safe is Xylocaine? In five years, over 500,000,000 injections of Xylocaine HCl Solution have been given for local anesthesia. "The apparent clinical safety of Xylocaine is gratifying, for without this quality, its additional properties would not warrant an enthusiastic report. Nor would safety alone call for a high recommendation unless additional desirable properties were to be found. The truth of the matter is, however, that Xylocaine approaches the ideal drug more closely than any other local anesthetic agent we have today."*

How effective is Xylocaine? Xylocaine HCl Solution produces more rapid, complete, and deeper anesthesia than other local anesthetics used in equivalent doses. By infiltration, Xylocaine gives a wide area of analgesia, and surrounding tissues are also anesthetized. The long duration of Xylocaine action reduces the need for additional injections. At the same time, it assures greater comfort to your patients for a longer period—often when they need it most.

How does Xylocaine fit into my practice? Xylocaine is the ideal agent for *local infiltration anesthesia* because it is safe, fast acting and of long duration. It is used routinely in daily practice for countless minor surgical procedures such as closure of lacerations, removal of cysts, moles and warts; treatment of abscesses; and in the reduction of fractures.

....is to use

XYLOCAINE®

It has also become the choice of many physicians for *therapeutic interruption of nerve function by temporary nerve blocks* in herpes zoster, subdeltoid bursitis, fibrositis, myalgia of shoulder muscles, periarthritis due to trauma, and painful postoperative scars. The relief of pain in these conditions at times appears to be the most important part of treatment.

The remarkable *topical anesthetic* properties of Xylocaine HCl Solution further enhance its usefulness for minor operations. Topical anesthesia can be obtained by spraying, by applying packs, by swabbing, or by instilling the solution into a cavity or on a surface.

Xylocaine HCl Solutions are available in 2 cc. ampuls, 20 cc. and 50 cc. vials in strengths of 0.5%, 1% and 2%, with or without epinephrine.

Bibliography of approximately 300 Xylocaine references upon request.

*Southworth, J. L., and Dabbs, C. H.: Xylocaine: a superior agent for conduction anesthesia, Anesth. & Analg. *32*:159 (May-June) 1953.

Astra Pharmaceutical Products, Inc., Worcester 6, Mass.

For
improved protein
nutrition

Cerofort®
elixir

(Critically essential L-lysine with essential B vitamins)

Potentiates protein synthesis in:

- *the elderly*
- *the convalescent*
- *the adolescent*
- *the growing child*

Efficient protein synthesis depends upon an adequate intake of proper proportions of all the essential amino acids simultaneously. The biological value of cereal proteins, which comprise 20-40% of total dietary proteins, is limited by a relative deficiency of lysine. Cerofort Elixir supplies physiological amounts of L-lysine to raise the body-building value of many cereals to that of high-quality animal muscle protein. And to aid tissue synthesis, Cerofort Elixir also supplies generous amounts of essential B vitamins.

also available:

Cerofort®
tablets

(Critically essential L-lysine with all the important vitamins)

to speed convalescence in major surgery, illness, injury.

White's *first with lysine*

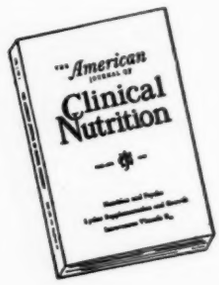
WHITE LABORATORIES, INC.
Kenilworth, N. J.

FOR

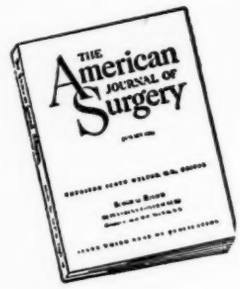
Christmas . THE IDEAL GIFT FOR

YOUR COLLEAGUE OR DOCTOR FRIEND

Presents University Medicine at Its Best
$12.



Presents Worldwide Nutrition
$8.



The Leading Independent Surgical Journal
$15.

Three outstanding journals at a new combined rate—$25. U.S.A.
Canada $27.50 Foreign $30.

You save $10 on this special Christmas offer.

The Yorke Publishing Co., Inc.
49 W. 45th St., New York 36, N.Y.

Please send Gift subscription of 3 Journals for one year and gift card to

_____

_____

_____

and bill me at your special rate of $25. U.S.A.

_____ _____

Name Address

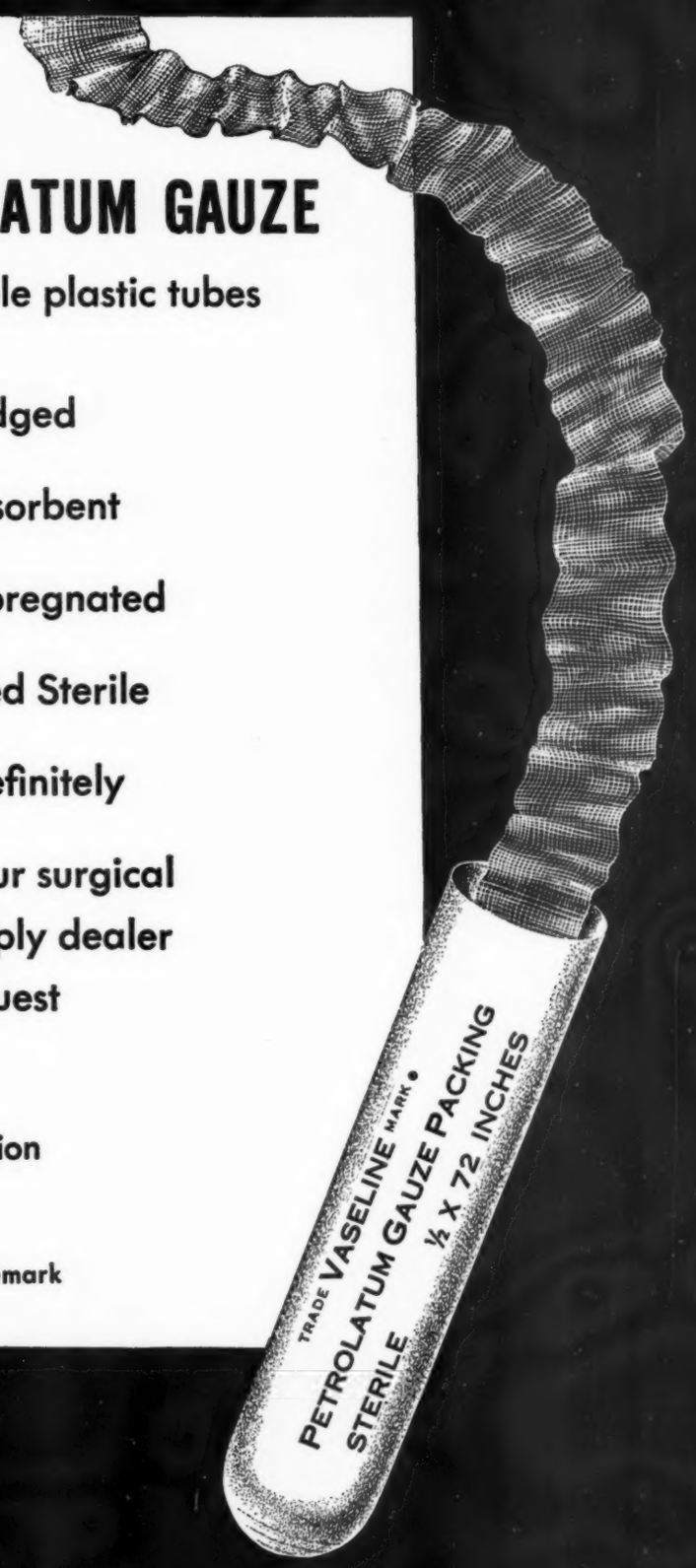
now
NEW HALF-INCH

VASELINE®
STERILE PETROLATUM GAUZE

½" x 72"... in disposable plastic tubes

- ★ Selvage-Edged
- ★ Highly Absorbent
- ★ Lightly Impregnated
- ★ Guaranteed Sterile
- ★ Keeps Indefinitely

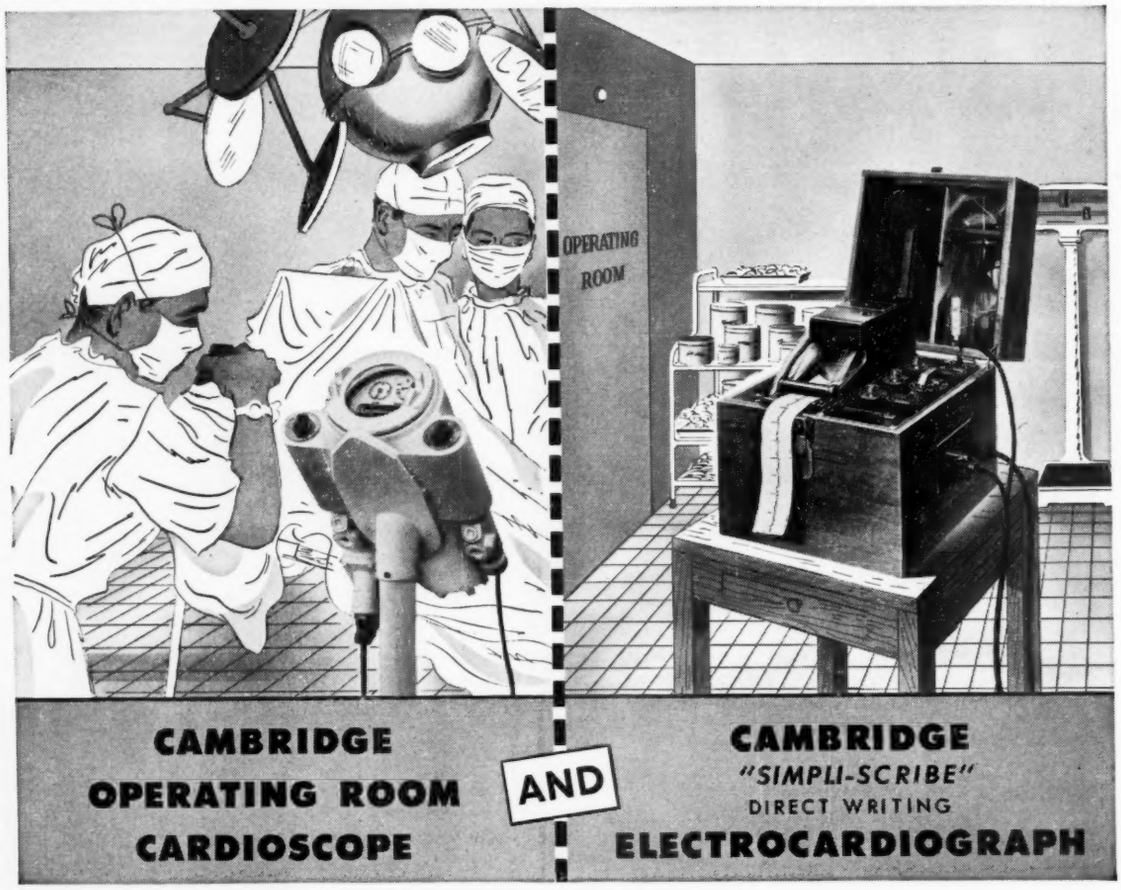
Order from your surgical
or hospital supply dealer
Sample on request



CHESEBROUGH-POND'S INC.
Professional Products Division
New York 17, N.Y.

VASELINE is the registered trademark
of Chesebrough-Pond's Inc.

Know . . . Don't Guess!



"It has taken the guesswork out of what is happening inside the patient. It has certainly increased the safety of hazardous operations."

• • •

The Cambridge Operating Room Cardioscope continuously indicates to the Anesthesiologist and Surgeon any lead of the patient's electrocardiogram and the instantaneous heart rate *or the patient's electroencephalogram.* Its sweep second hand is most convenient for timing respiration and for similar purposes. A cardiac standstill alarm gives audible warning instantly the heart rate drops below a selected critical minimum.

By simple operation of a remote control switch on the Cardioscope, any portion of any lead of the electrocardiogram *or the EEG* is recorded upon the Cambridge Simpli-Scribe Direct Writing Electrocardiograph located outside the Operating Room. In this manner, a continuous history of the patient's heart and *of the depths of anesthesia can be recorded during the operation.*

The Cardioscope incorporates the recommendations of prominent Anesthesiologists, Cardiologists and Surgeons. The Simpli-Scribe Electrocardiograph is a fine portable direct writing instrument embodying the design and manufacturing skill of Cambridge. Availability of this combination of instruments may well decide whether surgery is justified upon a poor risk patient.

It is *must* equipment for the modern operating room.

Send for Literature

CAMBRIDGE INSTRUMENT CO., Inc.

3032 Grand Central Terminal, New York 17, N. Y.
Cleveland 15, 1720 Euclid Avenue
Philadelphia 4, 135 South 36th Street
Chicago 39, 4000 West North Avenue
Detroit 2, 7410 Woodward Avenue
PIONEER MANUFACTURERS OF ELECTROCARDIOGRAPHS

CAMBRIDGE
ELECTROCARDIOGRAPHS

Requirements for Postgraduate Training in Proctology

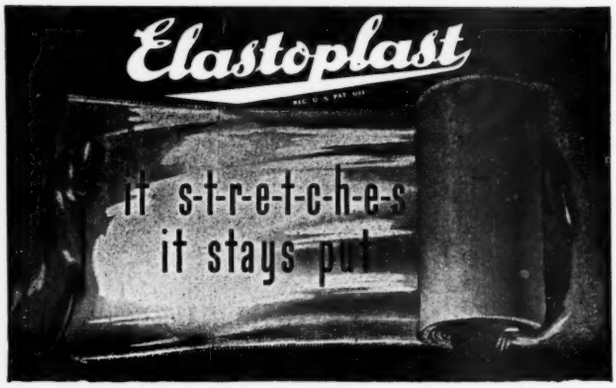
CANDIDATES desiring certification by the American Board of Proctology (colonic and anorectal surgery) may be admitted to examination following satisfactory completion of the requirements set forth below. Requirements of the Board for approved residencies correspond to those of the Council on Medical Education and Hospitals of the American Medical Association.

A candidate for a Proctologic residency approved by the Board must be a graduate of a medical school approved by the Council on Medical Education and Hospitals, and must have served an internship of at least one year in a hospital acceptable to that Council. In addition, he must have had specific training in general surgery after internship, including instruction in the basic sciences according to standards prescribed by the Board.

An applicant for examination leading to certification by the American Board of Proctology may qualify by any one of four methods: (1) two years of approved general surgical residency and two years of approved proctologic residency; or (2) three years of approved general surgical residency, and one year of approved proctologic residency by special arrangement with the Board; or (3) three years of approved general surgical residency and two years of approved proctologic precepteeship by special arrangement with the Board; or (4) two years of approved general surgical residency and three years of approved proctologic precepteeship.

Inquiries regarding available positions for residency should be addressed to Dr. Ross at the following address:

STUART T. ROSS, M.D.,
American Board of Proctology,
520 Franklin Ave.,
Garden City, N. Y.



For Comfort . . . Neatness . . For Support . . . Compression

The Dependable Original
E-L-A-S-T-I-C
Adhesive Bandage

ELASTOPLAST

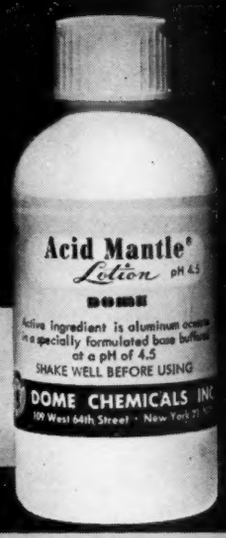
Trade Mark

Molds and holds to any contour . . . Allows joint motion . . . Provides firm support and controllable compression . . . Does not slip. Assures the neatest, most comfortable dressing in private and hospital practice. Available at your dealer in widths of 1, 2, 2½, 3, 4, 5 and 6 inches, 3 yards long (slack).

*** Elastoplast is also available in convenient unit dressings and compresses. Write for literature.**

DUKE LABORATORIES, INC.
SOUTH NORWALK, CONN., U. S. A.

Why Acid for hand eczema?


Acid Mantle®
Lotion pH 4.5
DOME
Active ingredient is aluminum acetate in a specially formulated base buffered at a pH of 4.5
SHAKE WELL BEFORE USING
DOME CHEMICALS INC
109 West 64th Street · New York 23

The normal skin has an acid pH between 4 and 6. This acid mantle acts as a protective barrier.

When the skin is washed with soap or detergents, or is exposed to chemicals, solvents, et cetera, the protective acid mantle is removed.

This exposes the unprotected skin to contact irritants and pathogenic organisms. It results in a rise in the skin pH above 7, provides a fertile field for development of harmful bacteria and fungi, and may result in various types of dermatitis.

Dome Acid Mantle returns the skin to its normal acid pH in a matter of seconds and holds it for hours. Both the creme and lotion are greaseless, stainless.

AVAILABLE—Acid Mantle Creme pH4.2 in 1 oz. tubes, 4 oz. and 16 oz. jars. Acid Mantle Lotion pH4.5 in 4 oz. squeeze bottles and 16 oz. bottles.

THERE'S NO SUBSTITUTE FOR
Acid Mantle®
CREME or LOTION-DOME pH4.2

DOME CHEMICALS INC.
109 W. 64 ST. NEW YORK 23, N.Y.

65th YEAR OF PUBLICATION

The Leading Independent Surgical Journal

PRESENTS THE PAPERS OF . . .
The American Association
for the Surgery of Trauma

•

The American Proctologic Society

•

The Pacific Coast Surgical Association

•

The American Society of Maxillofacial Surgeons

•

OTHER REGULAR FEATURES . . .

Modern Operative Technics
Practical Surgical Suggestions

START YOUR SUBSCRIPTION WITH THIS ISSUE

The American Journal of Surgery
49 West 45th St., New York 36, N. Y.
Please enter my subscription to The American Journal of Surgery. Yearly $15.00 U.S.A.—$16.00 Canada—$17 Foreign

Name.....

Address .....

City.....Zone.....State.....

Many ways to use

GEVRAL* PROTEIN

Geriatric Vitamin-Mineral-Protein Supplement Lederle

An excellent supplement, 60% protein, which provides 26 vitamins and minerals, in dry powder form. Can be sprinkled on or mixed with foods; dissolved in liquids. In wide-mouth jars of ½ lb. and cans of 5 lbs.

Lederle
*REG. U.S. PAT. OFF.

LEDERLE LABORATORIES DIVISION
AMERICAN CYANAMID COMPANY PEARL RIVER, N.Y.

THE NEW YORK POLYCLINIC
MEDICAL SCHOOL AND HOSPITAL
(ORGANIZED 1881)

(The Pioneer Post-Graduate Medical Institution in America)

SURGERY and ALLIED SUBJECTS

A combined surgical course comprising general surgery, traumatic surgery, abdominal surgery, gastroenterology, proctology, gynecological surgery, urological surgery. Attendance at lectures, witnessing operations, examination of patients pre-operatively and post-operatively and follow-up in the wards post-operatively. Pathology, radiology, physical medicine, anesthesia. Cadaver demonstrations in surgical anatomy, thoracic surgery, proctology, orthopedics. Operative surgery and operative gynecology on the cadaver; attendance at departmental and general conferences.

RADIOLOGY

A comprehensive review of the physics and higher mathematics involved, film interpretation, all standard general roentgen diagnostic procedures, methods of application and doses at radiation therapy, both x-ray and radium, standard and special fluoroscopic procedures. A review of dermatological lesions and tumors susceptible to roentgen therapy is given, together with methods and dosage calculation of treatments. Special attention is given to the newer diagnostic methods associated with the employment of contrast media, such as bronchography with Lipiodol, uterosalpingography, visualization of cardiac chambers, peri-renal insufflation and myelography. Discussions covering roentgen departmental management are also included; attendance at departmental and general conferences.

PRACTICAL ELECTROCARDIOGRAPHY

A two weeks part time elementary course for the practitioner based upon an understanding of electrophysiologic principles. Standard, unipolar and precordial electrocardiography of the normal heart. Bundle branch block, ventricular hypertrophy, and myocardial infarction considered from clinical as well as electrocardiographic viewpoints. Diagnosis of arrhythmias of clinical significance will be emphasized. Attendance at, and participation in, sessions of actual reading of routine hospital electrocardiograms.

COURSE FOR GENERAL PRACTITIONERS

Intensive full time instruction covering those subjects which are of particular interest to the physician in general practice. Fundamentals of the various medical and surgical specialties designed as a practical review of established procedures and recent advances in medicine and surgery. Subjects related to general medicine are covered and the surgical departments participate in giving fundamental instruction in their specialties. Pathology and radiology are included. The class is expected to attend departmental and general conferences.

FOR INFORMATION ABOUT THESE AND OTHER COURSES ADDRESS

THE DEAN, 345 West 50th Street, NEW YORK 19, N. Y.

COOK COUNTY
GRADUATE SCHOOL OF MEDICINE
INTENSIVE POSTGRADUATE COURSES
STARTING DATES—WINTER, 1956-1957

SURGERY—Surgical Technic, Two Weeks, November 26, December 10
Surgery of Colon & Rectum, One Week, November 26, March 4
General Surgery, One Week, February 11
General Surgery, Two Weeks, April 23
Surgical Anatomy & Clinical Surgery, Two Weeks, March 4
Basic Principles in General Surgery, Two Weeks, January 14
Fractures & Traumatic Surgery, Two Weeks, November 26

GYNECOLOGY & OBSTETRICS
Office & Operative Gynecology, Two Weeks, February 11
Vaginal Approach to Pelvic Surgery, One Week, February 4
General & Surgical Obstetrics, Two Weeks, February 25

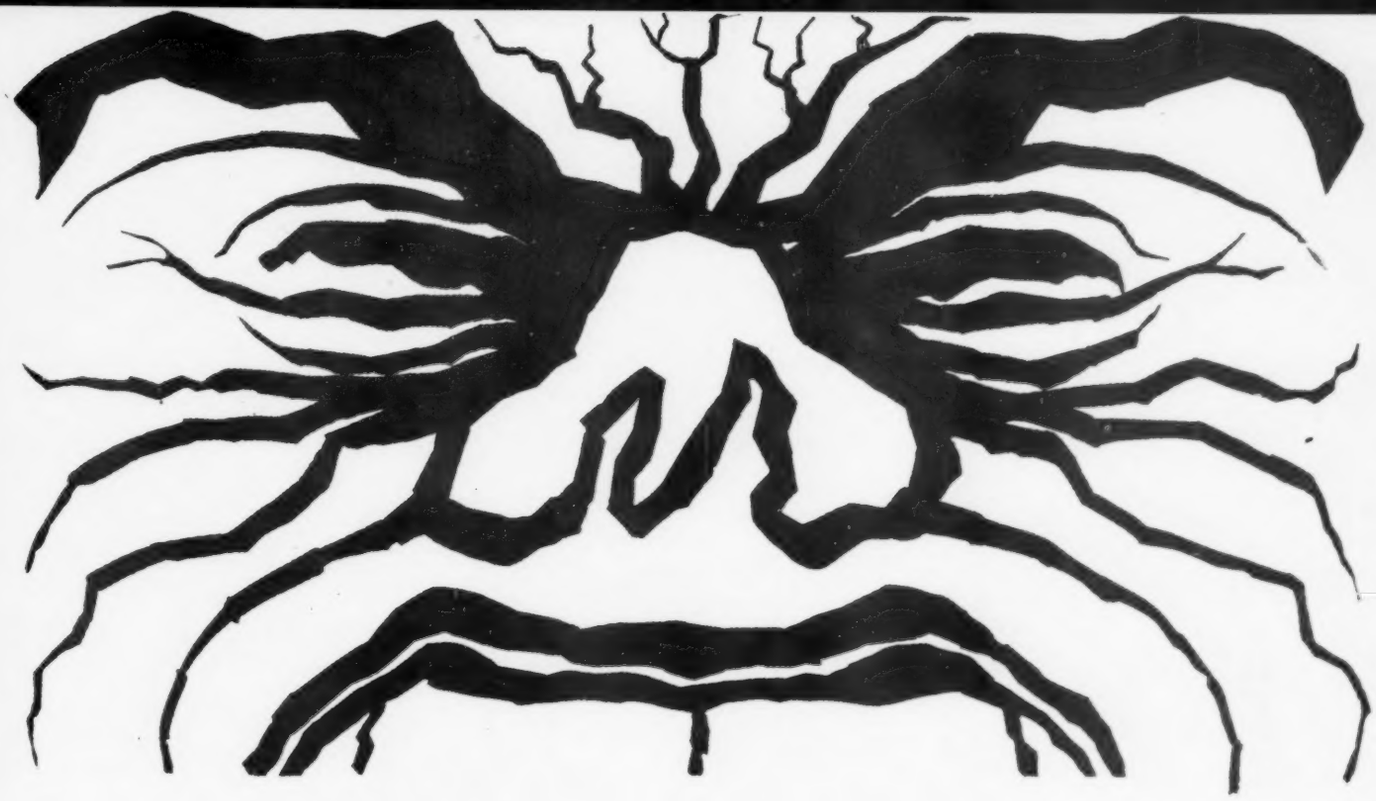
MEDICINE—Electrocardiography & Heart Disease, Two-Week Basic Course, March 11
Gastroenterology, Two Weeks, May 13
Dermatology, Two Weeks, May 6
Gastroscopy, Two Weeks, March 18

RADIOLOGY—Diagnostic X-Ray, Two Weeks, November 26
Clinical Uses of Radioisotopes, Two Weeks, May 6

UROLOGY—Two-Week Course April 1
Cystoscopy, Ten Days, by appointment

TEACHING FACULTY—ATTENDING STAFF
of Cook County Hospital

Address Registrar, **707 South Wood Street, Chicago 12, Illinois**



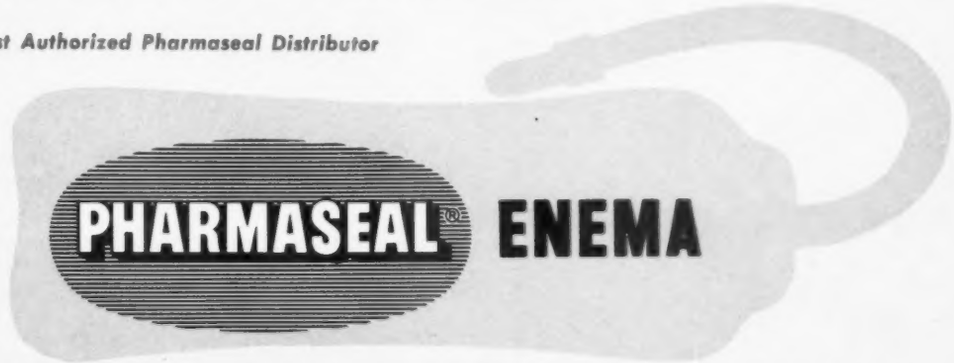
patients and nurses loathe the old-fashioned enema

. . . . *and with good reason*

The modern 4-ounce Pharmaseal® Enema is a safe, uniform, enema with an extra-long tip. Ready to use . . . no assembly, no preparation, and no messy cleanup. And for the patient it is more comfortable, easy to retain, and effective.

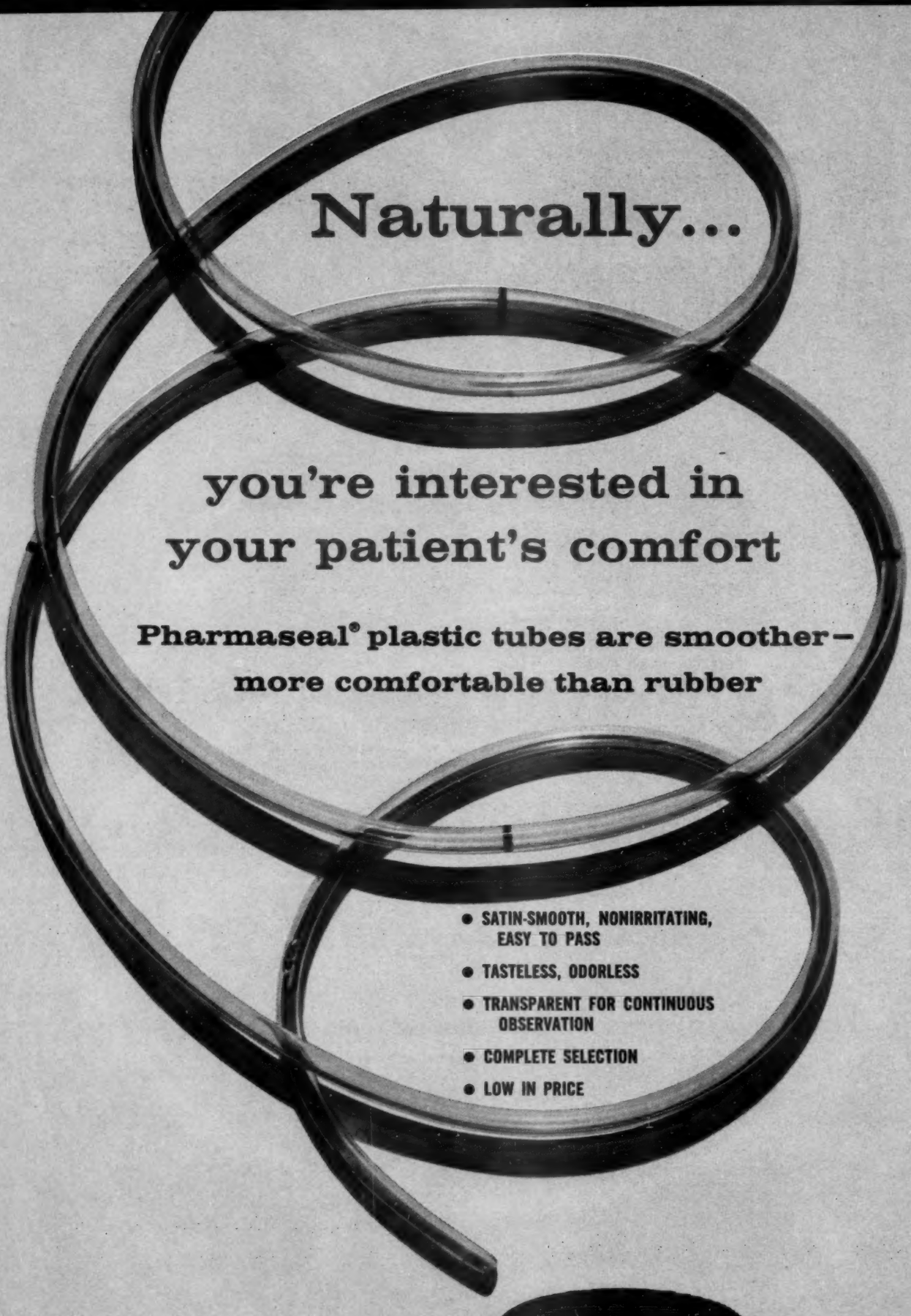
Available from your nearest Authorized Pharmaseal Distributor

PHARMASEAL
LABORATORIES
Glendale 1, California
Affiliate of Don Baxter, Inc.



ask your hospital to switch to the Pharmaseal Enema

Printed in U.S.A.



Naturally...

you're interested in your patient's comfort

Pharmaseal® plastic tubes are smoother—more comfortable than rubber

- SATIN-SMOOTH, NONIRRITATING, EASY TO PASS
- TASTELESS, ODORLESS
- TRANSPARENT FOR CONTINUOUS OBSERVATION
- COMPLETE SELECTION
- LOW IN PRICE

INSIST ON MODERN, MORE COMFORTABLE **PHARMASEAL®** PLASTIC TUBES

PHARMASEAL LABORATORIES
GLENDALE 1, CALIFORNIA
AFFILIATE OF DON BAXTER, INC.

Precision

IS IN THE BALANCE

...the Sharpness...the Strength

To meet the surgeon's need for PRECISION-dependability, every Crescent Blade is

- precision-made for fine balance
- precision-honed for extreme sharpness
- precision-tested for strength and rigidity
- precision-protected by the new moisture-proof, all-climate, aluminum-foil wrapping

Use of a new Swedish steel of high carbon content and unusually fine grain assures precision-performance in every "Master Blade" for the Master Hand.

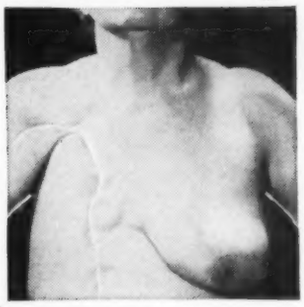
Samples on Request

CRESCENT SURGICAL SALES CO., INC.
48-41 Van Dam, Long Island City 1

Crescent

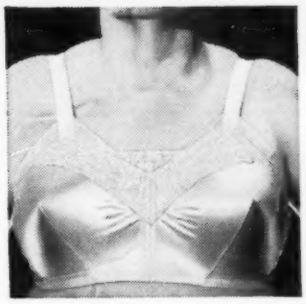
SURGICAL BLADES AND HANDLES

after Mastectomy



only

IDENTICAL® *form*



a "surprisingly simple" breast form

restores Normal Contour
Natural Alignment
Life-like Motion
Self Confidence

through balancing weight compensation and natural fluidity of motion

adaptable to any brassiere, even bathing suit

Recommended by leading doctors because of its excellent cosmetic results and its ability to meet the patient's previously overlooked physiological needs.

Available in 24 sizes. Expertly fitted in leading stores throughout the United States and Canada

Patented U.S.A. & Foreign Countries

IDENTICAL FORM, INC.
17 West 60 St., New York 23, N.Y.

Please send professional literature and list of authorized dealers.

_____ M.D.

Address _____

City _____ Zone _____ State _____

AJS

Shown above: Complete assembly and replaceable components

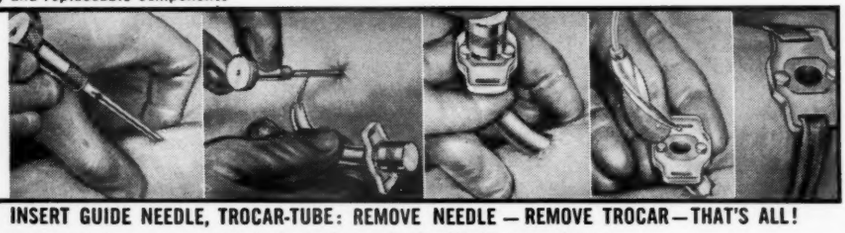
Sierra®-SHELDEN TRACHEOTOME

PAT APPLIED FOR

A Must for Surgeons – Anesthesiologists – Hospitals.

The Sierra-SHELDEN TRACHEOTOME is a complete instrument. Scientifically designed—precision made—thoroughly tested and proved on hundreds of cases. Safety-guide needle directs protective balled-end of trocar *into* the trachea. All parts replaceable. Complete, fully illustrated step-by-step INSTRUCTION BOOKLET packed with each instrument. "Made for specialists—by specialists."

Perform IMMEDIATE TRACHEOTOMY *In SECONDS!*



INSERT GUIDE NEEDLE, TROCAR-TUBE: REMOVE NEEDLE — REMOVE TROCAR—THAT'S ALL!

Before using, see complete technic packed with Tracheotome

Available through Surgical Supply Dealers

WRITE FOR FREE CATALOG

R.A. HAWKS **DIVISION** *Sierra Engineering Co.*

123 E. MONTECITO AVE., SIERRA MADRE, CALIF.

The American Journal of Surgery

publishes the papers of

Four Surgical Societies

The American Proctologic Society

The Pacific Coast Surgical Association

The American Society of Maxillofacial Surgeons

The American Association for the Surgery of Trauma

The American Journal of Surgery

49 West 45th Street, New York 36, New York

a wider range of activity against enteric pathogens

Neomycin-Mycostatin

(Squibb Neomycin-Nystatin)

tablets

effective against many intestinal bacteria

effective against yeasts and fungi (particularly Candida albicans)

Neomycin-Mycostatin Tablets not only provide protection against the bacteria responsible for many intestinal disorders, but also control the overgrowth of fungi, particularly Candida albicans (monilia), which sometimes results from the administration of neomycin alone.

Neomycin-Mycostatin Tablets, each containing 0.5 Gm. neomycin sulfate (equivalent to 0.35 Gm. neomycin base) and 125,000 units Mycostatin (Squibb Nystatin), are supplied in bottles of 20 and 100.

"MYCOSTATIN"® IS A SQUIBB TRADEMARK

SQUIBB *Squibb Quality—the Priceless Ingredient*

NOTES AND QUOTES

A NEW automatic device that minimizes the pain and fear associated with injections has been developed by Becton, Dickinson and Company. Called the B-D Presto Injector, the device completely conceals the needle which is automatically triggered when the circular rubber foot is pressed against the skin.

Small, light and comparatively easy to use, the injector is designed only for subcutaneous and intramuscular injections. It is designed to be used with Luer-Lok syringes only, either Multifit or Yale. Patients with diabetes should continue to use the No. 40 Busher Automatic Injector since the new device cannot accomodate the standard 1 cc. insulin syringe.

In addition to the concealed needle, special features designed to minimize pain and apprehension are: (1) a speed of needle penetration two or three times faster than that by manual technic; (2) "pressure anesthesia" when the rubber foot is pressed against the skin and masks the point of needle stimulus.

According to Frank H. J. Figge, PH.D. and Vernon M. Gilhaus, M.D., the new device will be "especially desirable" for giving injections to children as they will not be able to see the needle.

The latest in a series of full color anatomic illustrations, printed on transparent acetate and bound into a booklet to give an effect of visual segmental anatomy as the pages are turned, has just been issued by Pfizer Laboratories, Division of Chas. Pfizer & Co., Inc.

The booklet, prepared with the assistance of Dr. Philip Thorek of the University of Illinois, deals with the adrenal glands and kidneys. It includes a short description of salient features of surgical anatomy of the kidney and adrenal gland and transparencies and stereogram by Dr. Hans Elias, described by him and Dr. John E. Pauly, both of the Chicago Medical School. The stereogram shows the histology of the adrenal cortex.

The transparencies are offered only to physicians by Pfizer's professional service representatives, and have proved to be highly prized for reference purposes and as teaching aids. The first three of the five booklets, are now "out of stock."

The initial three sets were executed by Dr. Frank Netter, eminent medical artist. The first booklet illustrates the pathology of an advanced case of chronic pulmonary tuberculosis; the second shows the segmental anatomy on the lungs. Number three illustrates the clinical anatomy of the abdomen and inguinal region.

The fourth and fifth booklets, still in print, were executed by Dr. Elias. The fourth, with text by Dr. M. Edward Davis, also of the Chicago Medical School, shows the pregnant uterus at nine weeks' gestation.

The entire project was conceived and supervised by E. W. Whitney and E. J. Mills of the Pfizer Laboratories advertising department and Dr. Leo L. Leveridge of the medical department.

MOST of the 1,200 victims who each year lose their lives in accidents involving small boats are in the twenty to twenty-four year old age group, according to statisticians of the Metropolitan Life Insurance Company.

The high mortality rate among young men "reflects, in addition to the large numbers participating in boating activities, their greater readiness to expose themselves to danger," the statisticians point out.

A study of death claim records among the Metropolitan's industrial policyholders reveal that nearly three of every five insured persons who drowned were fishing; one-quarter of the victims were cruising, rowing or canoeing for pleasure; one-tenth were duck hunting, and an almost equal proportion were playing on rafts (these were practically all boys under fifteen).

Motor-driven craft, very largely outboards, were listed in three-fifths of small-boat drowning cases; rowboats, in one-fifth; canoes and rafts in virtually all the others. Sailboats, despite the popularity of sailing, appeared in the records of only two death claims.

The Coast Guard, through its rescue operations and its inspection service, has been rendering invaluable service to the large and growing number of boating enthusiasts, the statisticians point out. Major contributions to watercraft safety education have also been made by the National Safety Council, the Red Cross, Boy Scouts and boating organizations such as the United States Power Squadrons.

CONTINUED ON PAGE 56

UNIVERSAL BONE PLATE

The FIRST completely adjustable intertrochanteric bone plate! Designed to provide BOTH vertical and lateral angulation. For use with Smith-Peterson Nails or Lorenzo Screws. 35° range of vertical plane adjustment and 25° range of lateral adjustment to meet a wide variety of anatomical conditions. NO plate bending required. Properly adjusted angulation rigidly held by exclusive locking washer under double locking screw combination or solid Hex bolt. SMO stainless steel. No. 693.

Write for complete details!

Since 1895

DEPUY MANUFACTURING CO., INC.
WARSAW 4, INDIANA

PLASTIC foam bandages

DUROCEL
Reg. Trade Mark
Ethicon-Ewall Co.

for orthopedic use

NEW

- Comfort for patients
- Convenience for Surgeons

WRITE FOR DETAILS

Zimmer
MANUFACTURING CO., WARSAW, IND.

CAMP's new skin-traction legging

A new one-piece legging tested without complication by Camp on over 1,000 patients with back and hip injuries. Simple, easy application. For use in hospital or home. Write for information.

S. H. CAMP and COMPANY, Jackson, Michigan
World's Largest Manufacturer of Anatomical Supports

Colostomy and Ileostomy Patients

find MORE convenience and LONGER service with

PERRY APPLIANCES

large variety of models and sizes CUPS, BAGS, PROTECTORS and IRRIGATORS, MANY FEATURES found ONLY in PERRY appliances. Write for folders showing complete line.

MURLE PERRY
3803 East Lake Street
Minneapolis 6, Minn.

The RUSH MEDULLARY PIN
PATENTED

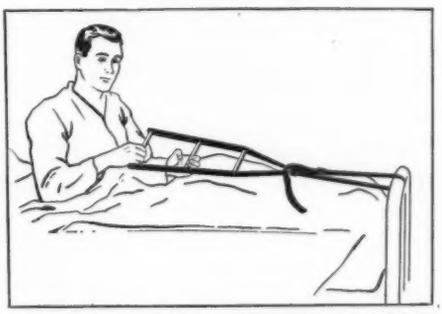
ONLY BY

BERIVON

Habit Forming!

THE BERIVON Company
MERIDIAN, MISS.

For Patient Protection



The New Posey "Patient Aid"

The new Posey "Patient Aid" is another rehabilitation product which encourages self-exercise and is a positive aid to the geriatric. The patient can raise himself without calling for the nurse.
Catalog #B-654 (For open end beds) $5.95 each. Catalog #B-654A (For beds with solid foot ends) $5.95 each.

J. T. POSEY COMPANY
801 N. Lake Avenue, Dept. AJS, Pasadena, California

NOTES AND QUOTES

Construction has begun on the nation's first Atomic Energy Commission medical research center containing a nuclear reactor designed specifically for medical research and therapy, as announced by Malan Construction Corp., of New York City, which recently was awarded a $5,141,879 *contract by the A. E. C. for construction of the project. The buildings are scheduled for completion late in* 1957.

The one-story medical center at Brookhaven, Long Island, will cover 2.7 *acres of an* 11 *acre site. It will house research laboratories for medical physics, pathology, microbiology, biochemistry and physiology, plus a forty-eight-bed research hospital, and an industrial medicine branch for Brookhaven personnel. A central facility will provide general laboratory and hospital services.*

The nuclear reactor will be housed separately in a circular steel building 60 *feet in diameter and* 54 *feet high, covering a gross area slightly less than* 5,000 *square feet. The core, process instruments,* 43,000 *pound shutters for the two reactor ports, wiring and console will be supplied and installed by separate contractors at a total cost of* $178,840.

The entire medical research center, including the reactor, is scheduled for completion in 1958 *at a cost of* $6,000,000 *exclusive of design and engineering. The Malan construction schedule calls for completion of the buildings, including that housing the reactor, within* 540 *days.*

THOS. LEEMING & COMPANY, New York, founded in 1881 by Thomas Lonsdale Leeming, is celebrating its seventy-fifth anniversary this year. A bronze medallion, created by A. S. Hardin, noted sculptor, commemorates the event.

At a time when almost every important advance in medicine came from European scientific centers, the Leeming Company started out as an importer and promoter of pharmaceutical specialties of European origin. The Company's best known product, Baume Bengué, was introduced in the United States from France in 1898 and has long been pre-eminent in its field.

In 1935, through the establishment of research fellowships and grants-in-aid at leading medical research and teaching centers, the Company started a long-range program of domestic pharmaceutical research development while continuing the investigation and promotion of products of European laboratories.

A rare operation in which the blood stream of a four year old child was made to by-pass a diseased liver through surgical means was described recently by Dr. Joseph A. Ritter at a meeting of the 7th annual institute on Current Concepts in Medical and Surgical Practice.

Dr. Ritter said the child, who recently underwent an operation, had portal hypertension, an increased pressure in the blood supply to the liver which had caused hemorrhaging. The ailment was diagnosed through splenoportography.

Surgeons removed the spleen and connected the splenic vein directly to the renal vein, thus by-passing the liver entirely. This sent the blood into the general blood stream rather than the portal system of the liver and relieved the portal hypertension.

THE next scheduled examination (Part I), written, and review of case histories for all candidates for the American Board of Obstetrics and Gynecology will be held in various cities of the United States, Canada and military centers outside the Continental United States on February 1, 1957. Candidates must submit case reports to the office of the Secretary within thirty days of being notified of their eligibility to Part I. Request for re-examination in Part II must be received prior to February 1, 1957.

Current Bulletins may be obtained by writing to: Dr. Robert L. Faulkner, Secretary, American Board of Obstetrics and Gynecology, 2105 Adelbert Road, Cleveland 6, Ohio.

On September 21st, Ethicon, Inc., a subsidiary of Johnson & Johnson, dedicated its new laboratory at Somerville, New Jersey. The administrative, manufacturing and research facilities are situated on a 200 acre countryside site. Approximately 750 guests attended the ceremony. The guest speaker was Dr. I. S. Ravdin, John Rhea Barton Professor of Surgery at the University of Pennsylvania. At the present time 600 people are employed in the Ethicon Laboratories making surgical sutures and allied products. Robert Wood Johnson is Chairman of the Board of Johnson & Johnson, and R. B. Sellars is President of Ethicon, Inc.

INTRAVENOUS BOTTLE HOLDER

Bottle Holder is secured between mattress and spring. Adjustable from approximately 24" to 48" in height from spring. Can be moved with patient from operating room to recovery room or to patient's room.

Catalog # 130 **$9.50 each**

RAJOWALT COMPANY, ATWOOD, INDIANA

Manufacturers of Fracture Equipment

Sold only through Surgical Dealers

Catalog sent upon request

RIB SPLINTS

Male and Female Styles

Substantial canvas to give perfect support in rib fractures. Buckle straps provide for snug adjustment to the contours of the body. Both styles are made in 24", 26", 28", 30", 34", 36", 38", 40", 42", 44", 46", and 48" sizes. Packed in individual cardboard cartons. Order today!

OEC *Orthopedic* EQUIPMENT CO. BOURBON INDIANA

OFFICE SCRUB-UP can be as thoro as pre-op preparation . . .

WITHOUT WASTE OF TIME OR MONEY!

Free

97% bacteria reduction with daily 3 minute scrub. Ideal for office or clinic. Hands stay soft . . . **feel clean!** $5.50 per gallon, delivered U.S., free 8 oz. plastic dispenser. Money back if not satisfied.

Huntington Laboratories

Huntington, Ind. • Toronto, Ont.

GERMA-MEDICA WITH HEXACHLOROPHENE

LIQUID SURGICAL SOAP

"G U M P"

PREVENTS BROKEN TEETH

DURING

BRONCHOSCOPY

LARYNGOSCOPY

TONSILLECTOMY

EXTRACTION

Tooth fragments can cause trouble. Avoid them by using Gumps. GUMP fits either upper or lower teeth. Soft rubber. Held securely by suction. Adult or child size.

$1.50 each; pair $3.00

Order from your dealer.

SIL-SPRAY

PURE SILICONE LUBRICANT

Lubricate, rustproof instruments, guns, etc. Spray-can for hard-to-reach places. Heat-proof, cold-proof. Odorless, colorless, non-toxic.

12 oz. Can—$3.95

Order from your dealer.

DUXE PRODUCTS

205 Keith Bldg. **Cincinnati 2, O.**

PAIN-

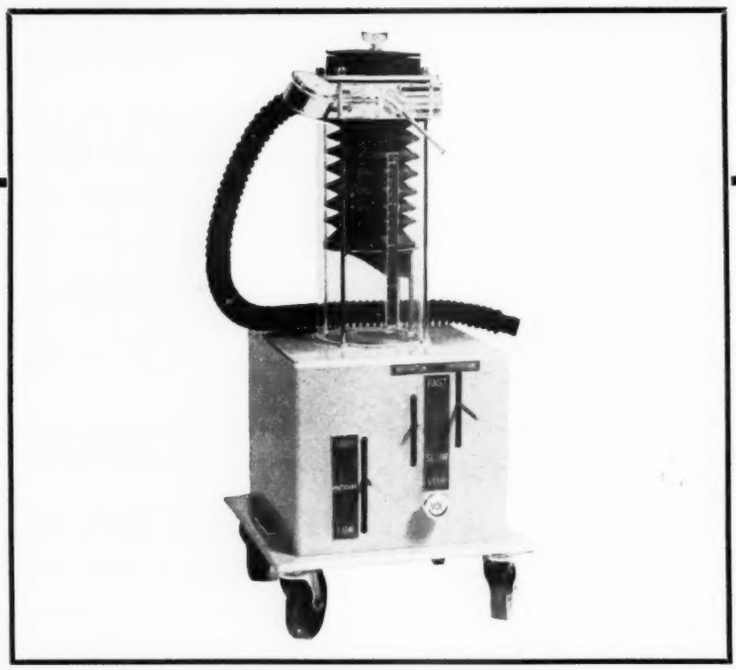
The predominant symptom for which a majority of patients seek medical help.

For nerve block control of neuralgic phases of somatic pain, SARAPIN, the aqueous non-toxic distillate of Pitcher Plant has been used successfully by clinicians throughout the country for nearly a decade.

An extensive discussion giving details of the technique of regional analgesia may be found in our booklet "Sarapin, Injection Technique in Pain Control," and is available on request.

HIGH CHEMICAL COMPANY

Philadelphia 22, Pa.



for safer, more efficient anesthesia . . .

THE MÖRCH SURGICAL RESPIRATOR

This surgical respirator is the result of twenty years of research. Operated by compressed air or oxygen, it has no electrical components. Connects to any anesthesia apparatus and provides easy adjustment of rate, pressure and volume. As an aid to surgery, it performs these functions:

- **Controls respiration.**
- **Provides quieter surgical field.**
- **Relaxes abdominal wall.**
- **Reduces amount of anesthesia needed.**
- **Can be used as emergency resuscitator.**

32½" high, the base is 14½" square. Four 4" swivel conductive casters. Rate of respiration: at 700 cc of volume up to 24 per min. Optimum: 16 to 20 per min. Operation pressure: a line of compressed air or oxygen from 20 to 100 lbs. needed. Closed anesthesia system is preferred, but can be used with semi-closed systems. Pressure range: adjustable from negative of 20 mm. of Hg to positive of 30 mm. of Hg.

Each **$590.00**

Armamentarium

V MUELLER & CO.
330 South Honore Street
Chicago 12, Illinois
Dallas • Houston • Los Angeles • Rochester, Minn.

Urinary Antibacterial and Analgesic in one tablet

AZO GANTRISIN 'ROCHE'

The single, soluble, well-tolerated sulfonamide effectively combats -- both systemically and locally -- a wide range of infections in the urinary tract. And a soothing urogenital analgesic rapidly relieves the distressing symptoms.

Each Azo Gantrisin tablet contains 0.5 Gm Gantrisin 'Roche' plus 50 mg phenylazo-diamino-pyridine HCl.

Gantrisin® - brand of sulfisoxazole

ROCHE

For patients harried by hurry and worry —

Noludar 'Roche' brings calm and quiet. Not a barbiturate, not habit forming, 50 mg t.i.d. provides daytime sedation with little or no loss of acuity, or 200 mg h.s. induces a sound night's sleep with a refreshed and clear-headed awakening. Noludar tablets, 50 and 200 mg; elixir, 50 mg per teaspoonful. Hoffmann-La Roche Inc, Nutley, New Jersey.

Noludar® brand of methyprylon

NOVEMBER 1956

THE American JOURNAL OF Surgery

ADVERTISERS INDEX

Abbott Laboratories. *Insert Facing Page* 34, 40
Air-Shields, Inc. 38
American Hospital Supply Corporation. 4
American Safety Razor Corp. 13
Ames Company, Inc. 1
Astra Pharmaceutical Products, Inc. *Insert Facing Page* 42
Ayerst Laboratories. 8
Bard-Parker Company, Inc. 33
Baxter Laboratories, Inc. 4
The Berivon Company. 55
Cambridge Instrument Co., Inc. 46
S. H. Camp and Company. 55
Chesebrough-Pond's Inc. 45
Ciba Pharmaceutical Products, Inc. *Back Cover*
Cook County Grad. School of Medicine. 50
Crescent Surgical Sales Co., Inc. 51
Cutter Laboratories. 6
Davis & Geck, Inc. *Insert Facing Page* 16
J. A. Deknatel & Son, Inc. 36
De Puy Manufacturing Co., Inc. 55
Desitin Chemical Company. 35
Dome Chemicals Inc. 48
Duke Laboratories, Inc. 48
Duxe Products. 57
Eastman Kodak Company. 42
Eaton Laboratories. 17
Ethicon Suture Laboratories, Inc. *Insert Facing Page* 8
Gudebrod Bros. Silk Co., Inc. *Insert Facing Page* 24
High Chemical Company. 57
Hoffmann-La Roche, Inc. *Insert Facing Page* 58
Huntington Laboratories. 57
Identical Form, Inc. 51
Johnson & Johnson. 14, 21
Lederle Laboratories. 10, 19, 49
Lewal Pharmaceutical Company. 12
Liebel-Flarsheim Co. 41
Eli Lilly and Company. 32
The S. E. Massengill Company. 29
Mead Johnson & Company. 22
Merck Sharp & Dohme. 9, 20, 30
V. Mueller & Co. 58
N. Y. Polyclinic Medical School & Hospital. 50
Notes and Quotes. 54, 56
Orthopedic Equipment Co. 57
Parke, Davis & Company. 39
Murle Perry. 55
Pfizer Laboratories, Division, Chas. Pfizer & Co., Inc. 25–26–27–28
Pharmaseal Laboratories. *Insert Facing Page* 50
Geo. P. Pilling & Son Company. 37
J. T. Posey Company. 55
Rajowalt Company. 57
Rystan Company. 23
Sierra Engineering Co. 52
J. Sklar Mfg. Co., Inc. 15
Smith & Nephew, Inc. 24
E. R. Squibb & Son, Division of Mathieson Chemical Corp. 53
The Surgeon's Mart. 55, 57
Edward Weck & Co., Inc. 18
Welch Allyn, Inc. 34
White Laboratories, Inc. 43
Winthrop Laboratories. 2
Wyeth Laboratories. 11, 16, 31
Zimmer Manufacturing Co. 55

for postoperative comfort

Nupercainal®

topical anesthetic

Even minor surgery leaves discomfort in its wake. Anesthetize the wound in those trying postoperative days with Nupercainal Ointment, the soothing, long-acting topical anesthetic. Potent, yet rarely sensitizing, Nupercainal is indicated postoperatively in episiotomy, circumcision, varicose ulcers, hemorrhoidectomy, etc.

OINTMENT, 1% Nupercaine® (dibucaine CIBA) in lanolin and petrolatum base; tubes of 1 ounce, with "peel-off" labels and rectal applicator, and jars of 1 pound for office use.

CREAM, 0.5% Nupercaine in water-soluble base; tubes of 1¼ ounces.

OPHTHALMIC OINTMENT, 0.5% Nupercaine in white petrolatum; applicator-tip tubes of 4 Gm.

NUPERCAINAL® Ointment (dibucaine ointment CIBA)

NUPERCAINAL® Cream (dibucaine cream CIBA)

CIBA

SUMMIT, N. J.

2/2278M